AN EVALUATION OF MIDDLE SCHOOL SCIENCE TEACHING METHODS IN THE TULSA PUBLIC SCHOOL SYSTEM

By

KATHRYN LOUISE AINSWORTH

Bachelor of Science

University of Tulsa

Tulsa, Oklahoma

1972

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE
May, 1997

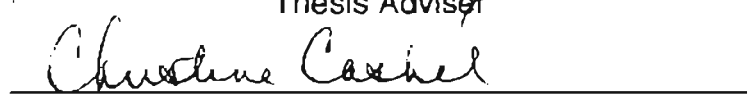
AN EVALUATION OF MIDDLE SCHOOL SCIENCE

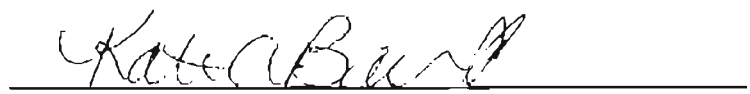
TEACHING METHODS IN THE TULSA

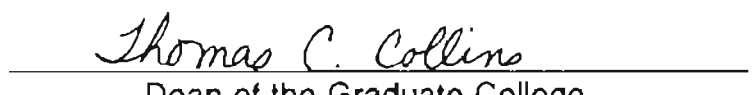
PUBLIC SCHOOL SYSTEM

Thesis Approved:

Thesis Adviser







Dean of the Graduate College

PREFACE

This study was conducted in order to evaluate the teaching methods currently being used by Tulsa Public School middle school science teachers, the frequency of hands-on methods versus traditional methods, and the restricting factors affecting them. Availability and utilization of outdoor classroom sites as well as methods employed in environmental education was also investigated. The results of the survey given to Tulsa Public School teachers were compared to the National Science Foundation survey conducted in 1977, in order that the analysis of the findings might provide insight into the changes in teaching methods since that survey was carried out.

I sincerely thank my advisor Dr. Lowell Caneday for his suggestions, guidance and continued encouragement. My appreciation extends to my other committee members Dr. Kate Baird and Dr. Chris Cashel whose constructive support and assistance were invaluable. I also thank Mrs. Wanda East for her aid in conducting the survey. I would also like to express my sincere appreciation and gratitude to my colleagues.

TABLE OF CONTENTS

LIST OF TABLES

Table

LIST OF FIGURES

CHAPTER I

AN EVALUATION OF MIDDLE SCHOOL SCIENCE TEACHING METHODS IN THE TULSA PUBLIC SCHOOL SYSTEM

Introduction

This chapter begins with a brief explanation for the reasons initiating this study of science teaching methods in the Tulsa Public School System (TPS). Next the following areas will be focused on: the purpose of the study, definition of terms, significance of the study, assumptions, limitations, and the organization of the study.

When a thirteen year old student with an arrogant attitude is excited about science class, questions concerning how this happened come to mind. What is going on in science class to cause this rare moment? What is going on in the science class down the hall or science classes in other middle schools? What teaching methods are being utilized? What teaching conditions promote success or restrict the teaching process? Do most schools have an outdoor classroom? Do most teachers have ample and up-to-date equipment and textbooks? What are the current conditions and teaching methods being utilized in middle school science classes in the Tulsa Public School System?

For much of the history of education, the methods of science teaching have been knowledge based, with great emphasis placed on rote memorization. Due to both social and religious factors, students received little encouragement to experiment or deviate from the facts they were taught (DeBoer, 1991).

In 1957, the advent of Sputnik gave a push to overhaul science education in the United States. From 1955 to 1975, the National Science Foundation (NSF) provided massive funding and training for science programs in the elementary and secondary grades. The NSF programs were referred to as the new curricula. The major difference in the new curricula and traditional methods of science teaching was the use of a hands-on approach (Duschl, 1990).

There are many studies that support the advocacy of activity-oriented methods. In 1982, Ted Bredderman conducted sixty studies of students in 1,000 classrooms comparing hands-on science methods. His findings speak for themselves: "...with the use of activity-based science programs, teachers can expect substantially improved performance in science process and creativity; modestly increased performance on tests of perception, logic, language development, science content, and math; modestly improved attitudes toward science and science class; and pronounced benefits for disadvantaged students" (Bredderman, 1982, p. 41).

Despite the positive effects, by the middle of the 1970's the new curricula had lost its drive. What caused this to happen? In Yager and Stodghills report of 1979, Stanley L. Helgeson, Robert Stake, and others concluded the new curricula focused more on pure content which left little room for teacher and student spontaneity. Relevance, fulfillment of immediate objectives, job-related learning and practical applications of science to technology were also missing. Many teachers did not feel comfortable teaching with the hands-on method.

Shymansky argues in his article of 1982 that the activity-based new curricula never really had a chance, because no more than 25 percent of the schools ever succeeded in getting it adopted. However, those who did use the new curricula programs placed them in high regard. Also noted was a positive attitude toward science by the students.

The National Survey of Science, Mathematics, and Social Studies Education by the NSF of 1977 found a large discrepancy between what is desired and what is actually practiced as far as inquiry goes (Welch,Klopfer, Glen, Robinson, 1981). Recognizing that teachers were not using hands-on methods predominantly in their classrooms, despite the knowledge that it was the preferred method disturbed the surveyors of the NSF study. Weiss found that almost one teacher in ten did not use hands-on at any time during the school year (Weiss, 1978).

The use of outdoor sites are an important component in teaching environmental topics. The next section focuses on this view.

The state of the environment has become a major concern in the recent decades of this century. There are many environmental crises that threaten the Earth's ecosystem. The future of the environment lies in the hands of the youth. Students need education in environmental issues (Horwood, 1990).

Today there are many environmental curricula available for educators to use. However, another part of the teaching strategy besides lesson plans and textbooks is the outdoor site. The most appropriate place to teach about the environment is outdoors (Riddleberger, 1990). By incorporating outdoor sites

the learning process will be enhanced by providing direct hands-on learning experience in environmental processes and provide a basis for understanding environmental relationships (Alexander, 1991).

Purpose of the Study

A majority of elementary and secondary science teachers still use traditional teaching methods even though the superiority of hands-on science education was established about 1975. Research indicates there is a definite gap between what teachers acknowledge as the most appropriate and successful method and the actual classroom methods practiced (Welch, et al.1981). Is this national trend away from hands-on teaching methods reflected in Tulsa Public middle school science classrooms of today? Do teachers continue to use a knowledge based curriculum despite its limited effectiveness in lieu of inquiry based education?

The purpose of this study was to evaluate middle school science teaching methods in the Tulsa Public School System. This purpose is sub-divided into four research questions.

1. What is the extent to which hands-on teaching methods and traditional methods are currently being utilized?
2. From among a prescribed list of factors which affect teaching conditions, which factors limit or restrict teaching most frequently?
3. Is there a relationship between the teaching method practiced and the number of years of teaching experience?

4. How often is an outdoor site utilized for environmental teaching purposes?

Definition of Terms

The following terms are specifically defined as they are used in this study.

Activity oriented involves all of the senses and enables the students to participate directly in their own learning experience (Carin, Sund, 1970).

Back to basics is a movement purported to bring students to a knowledge based curriculum with the rationale that facts are more important than processes (Duschl, 1990).

Criterion Referenced Tests are a series of science tests for the Priority Academic Student Skills that have been developed as part of the Oklahoma Student Testing Program. These tests use science process skills to measure how well students can apply science content (Oklahoma State Department of Education, 1994).

Discovery method or approach is a teaching method in which the learner discovers or constructs principles or concepts by interacting with instances of those principles (DeBoer, 1991).

Hands-on refers to learning from the materials and processes of the natural world through direct observation, manipulation, and experimentation (Sivertsen, 1993).

Inquiry is defined by the National Science Education Standards of 1996, as the following: "...activities of students in which they develop knowledge and

understanding of scientific ideas, as well as an understanding of how scientists study the natural world" (National Research Council, 1996, p. 23).

Knowledge based approach employs students' limited participation in active learning and a reliance on memorization and recall (Carin, Sund. 1970).

National Science Education Standards is a guide toward a scientifically literate society. The standards for content define what the scientifically literate person should know, understand and be able to do after 13 years of school science. Also included are standards for assessment, teaching, program and system that describe the conditions necessary to achieve the goal of scientific literacy for all students (National Research Council, 1996).

New curricula advocates the use of inquiry and experimentation as the preferred method of teaching science by the National Science Foundation as a result of the 1977 survey (DeBoer, 1991).

Outdoor site or classroom is an outdoor site with no walls. Provides hands-on experiences necessary to understand environmental as well as other concepts (Alexander, 1991).

P.A.S.S. stands for Priority Academic Student Skills. These are the skills and knowledge students should demonstrate at specified grade levels in the science core curriculum area. In Oklahoma a suggested list of broad science content is provided from which a school district may build a K-12 science curriculum content (Oklahoma State Department of Education, 1994).

Process skills include observing, measuring, inferring, experimenting, classifying, and interpreting data (National Research Council, 1996).

Product is defined as the factual learning without employing application (Duschl, 1990).

Scientific Literacy is defined by the National Science Education Standards as being the knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs and economic productivity (National Research Council, 1996).

Traditional textbook approach is a teaching method which is limited to reading, discussing, and lecture and pertains to the internalization of factual information by the student (Carin, Sund, 1970).

Significance of the Study

This study provides current statistical information on the status of science teaching in the Tulsa Public School System in the following areas:

1. Educational background of teachers.
2. Teaching experience and methods.
3. Teaching conditions.
4. Teaching environmental education.

The study documents the level of usage of hands-on teaching methods versus traditional teaching methods in the Tulsa district and the degree to which both are used. Also comparisons of years of teaching experience to teaching methods are defined as well as identifying what factors may limit or restrict teaching. This information may be used to effect changes on many levels, such

as funding for science classrooms, providing on site outdoor classrooms and teacher training.

Assumptions

There exists the underlying theories that the education of process; i.e. discovery, is more valuable to a student's learning than product, which may be little more than rote memorization. This is reflected in feedback from the industrial and business community which emphasizes the importance of teaching students to utilize the process skills in their work lives rather than product skills (Sivertson, 1993).

Also the respondent's choice of answers to the survey are assumed to be honest, however there are conditions that may interfere with such selections. The problem of some of the respondents personally knowing the surveyor may influence their response. Teaching friends of the surveyor may bias results to please the surveyor by choosing what they believe to be the desired response. Also some teachers may rush through the survey and not read each question thoroughly before answering.

Limitations

There are inherent limitations in surveying only middle school science teachers in the Tulsa Public School System rather than science teachers K-12. These limitations are significant in that the sample may not be representative of the population in the area of teacher training. As a result, generalizability of the

recommendations will be affected by these limitations. Due to the fact the total population of middle school science teachers of the Tulsa Public School System will be surveyed and can be contacted by phone for those who do not respond to the survey, the problem of nonresponse was reduced. Another limitation which affects the results of the study is the small number of middle school science teachers in the Tulsa Public School System. There are only 64 TPS middle school science teachers. Surveying 64 teachers rather than a larger number will affect the generalizability of the survey.

Organization of the Study

The review of the literature discusses briefly the history of teaching methods followed by evidence of hands-on methods being more successful than the traditional textbook approach. Lastly, the disuse of hands-on science methodology is discussed. The research questions are discussed and investigated using the descriptive research method which are detailed in Chapter III. The entire population of middle school science teachers in the Tulsa Public School System were surveyed. The questionnaire contains questions similar to the 1977 NSF National Survey of Science, Mathematics, and Social Studies Education. The data were analyzed by calculating the percentages of responses and comparing variables using the chi square goodness of fit test. The appendix contains the questionnaire, reminder letter, data tables and comments from teachers surveyed. The paper concludes with a listing of references.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

The purpose of reviewing the literature is to give a brief overview of the following topics:

- Early science curricula.
- NSF influence on the development of science curricula.
- Studies comparing the usage of hands-on and traditional teaching methods.
- The purpose of the National Survey of Science, Mathematics, and Social Studies Education.
- 1970's to 1996 development and revisions of the Tulsa Public School science curriculum.
- National Science Education Standards.
- The importance of outdoor sites in environmental education.

Early Science Curricula

For many years science was not considered to be an integral part of the educational process. In his 1869 address, however, Charles W. Eliot, president of Harvard University, stated that science teaching was there to stay (DeBoer, 1991). The science curriculum that remained was based upon memorization of scientific principles and their applications for the most part; although the

discovery approach was advanced for the laboratory setting during the early 1900's (DeBoer, 1991).

The impact of Piaget's theories on science education rivaled that of Sputnik. His precepts influenced theorists to restructure science education to reflect the changing needs of students as they developed intellectually. This led educators to hypothesize that direct sensory experiences would enhance students' understanding and concept retention (Carin & Sund, 1970).

NSF Influence on the Development of Science Curricula

After the Soviet Union successfully launched its Sputnik satellite, science education had become a national priority in the United States. Congress allocated nine million dollars in 1958 for science education institutes, and 46 percent of its total budget was earmarked for National Science Foundation (NSF) science education programs. By 1964, NSF was funding seven elementary or junior high school science projects and five projects at the high school level. By 1966 the number of NSF projects jumped to nineteen (Duschl, 1990).

The NSF projects were designed and developed by scientists and teams of teachers and administrators (Duschl, 1990) and the new curricula were believed to be an improvement over the fact-oriented textbook method (Mechling, Oliver, 1983). But it was clear from the start that the scientists, not teachers, were in charge of the new curricula. After teachers field tested a draft of a project, their feedback had very little impact on the new versions of the

curricula. The scientists were hesitant to take advice from schoolteachers (Duschl, 1990). Even at this early period of the new curricula the back-to-basics advocates believed that if students were having fun discovering, they probably were not learning much anyway (Duschl, 1990).

Studies Comparing the Usage of Hands-on and Traditional Teaching Methods

Various reports support the advocacy of hands-on science methods. A study, by Regan Carpenter in 1963, compared the activity-oriented approach with the textbook-recitation methods of teaching fourth-grade students. He found the activity-oriented approach brought the most gain in content learning. His report also found that slower learners thrived in an activity-oriented science class (Carpenter, 1963).

Another study by Bredderman in 1982, concluded that children in hands-on classes clearly outperformed those in traditional classes after comparing three activity-based science curricula with the traditional read-and-recite approach. The greatest gains were in the areas of process skills. Again, it was noted that many academically or economically disadvantaged students succeeded in school in the activity-based settings. This is due to the fact that hands-on science classes do not rely heavily on reading skills. The poor readers feel on a more equal ground with their classmates and therefore are able to succeed.

Process skill development was shown to improve in the new curricula. The NSF funded program Elementary Science Study (ESS), which is hands-on based, was compared to the traditional teaching methods. It was found that

students scored at least 18 percentile points higher in the ESS classroom than in traditional class on measures of process skill development (Shymansky, Kyle, Alport, 1982).

Application of science was also found to improve with hands-on science instruction. John Renner compared two groups of thirty elementary students. Each group was tested on science process skills. Group 1 received hands-on science using the Science Curriculum Improvement Study (SCIS) and Group 2 was exposed only to a read-and-recite approach. The SCIS program, he concluded, enabled the children to apply science in everyday life (Renner, Stafford, Coffia, Kellogg, Weber, 1972).

Not only were there academic benefits of the hands-on method, there were also changes in students' attitude. The Shymansky study showed evidence of development of a positive attitude among students. In his research the question of attitude was approached in three ways: "(1) attitude toward the new course, (2) attitude toward science, and (3) attitude toward self. In each of these categories, student attitudes were more positive toward the new programs than toward the traditional ones,..." (Shymansky, Kyle, Alport, 1982, p.14).

Despite the evidence that supports the use of hands-on methods many teachers rely on the textbook. Donald L. Wright states that "Fifty to eighty percent of all science classes use a single text or multiple texts as the basis for instruction...For students, knowing is more a function of reading, digesting, and regurgitating information from the textbook or lab manual than it is of analyzing, synthesizing, and evaluating" (Mechling, Oliver, 1983, p. 43).

Why did teachers choose not to utilize hands-on methods? Some teachers had feelings of inadequacy because they had not had proper training in inquiry methodology. Also state mandates were too difficult to meet. There were problems obtaining equipment and supplies for hands-on activities. Preparation time was also a drawback for some teachers. Many teachers considered inquiry methods as dangerous in classrooms with discipline problems. Moreover, some felt the inquiry approach was too difficult except for the brightest students (Welch, et al. 1981).

In recent years there has been an almost universal promotion of inquiry based science education among both teachers and educational theorists (Welch, et al. 1981). The problem is that this method is being under utilized in a preponderance of classrooms at all levels of the education system (DeBoer, 1991).

The Report of the 1977 National Survey of Science, Mathematics and Social Studies Education stated that teachers who did not have training in hands-on methods, relied heavily on the textbook approach. On the other hand, teachers who did attend the NSF sponsored workshops, used the hands-on approach much more often (Weiss, 1978). Data collected from three National Science Foundation studies of precollege science education surveys suggest that the textbook's domination "tends to discourage use of inquiry techniques which require students to do more than look up information in the text and then recite or record it" (Smith, 1980, p. 44). The researchers interpretation from the three NSF surveys indicate that the use of hands-on methods require more

effort and time from the students in performing the activity than in using a textbook. Also the teachers preparation of hands-on activities are extremely time consuming and require more effort than planning a textbook lesson.

More recently, researchers Robert Yager and Ronald Stodghill, found in their studies in the 1980's that most teachers prefer the textbook. The textbook determines the content, order, examples, and application. Teachers appear to have 'faith' in the textbook; they lament "if only the right one could be found..." (Yager, Stodghill,1980, p. 166).

This pinning of all curricular hopes on that perfect textbook is an about-face from the NSF funded projects of the 1970's. In the March, 1983, issue of Principal, there are data that fifty to eighty percent of all science classes use a single text or multiple texts as the basis for instruction (Mechling, Oliver, 1983, p. 43). This was not what was expected by the advocates of the new curricula (Duschl, 1990).

"It seems that attempts to reduce dependence on teacher's decisions, by providing a pre-planned series of activities, tend to constrain children's experiences,..." (Harlen, 1985, p. 229). Thus, increased use of the textbook decreases teacher creativity and student interest. This makes the current trend of textbook dominance that much more disturbing (Welch, et al. 1981).

The Purpose of the National Survey of Science, Mathematics, and Social Studies Education of 1977

The 1977 National Survey of Science, Mathematics, and Social Studies Education was organized by the Research Triangle Institute (RTI) under contract by the NSF. The purpose of the study was to answer the following questions:

1. What science courses are currently offered in schools?
2. What local and state guidelines exist for the specification of minimal science experiences for students?
3. What texts, laboratory manuals, curriculum kits, modules, etc., are being used in science classrooms?
4. What share of the market is held by specific textbooks at the various grade levels and subject areas?
5. What regional patterns of curriculum usage are evident? What patterns exist with respect to urban, suburban, rural, and other geographic variables?
6. What "hands-on" materials, such as laboratory or activity centered materials, are being used? What is the extent and frequency of their use by grade level and subject matter?
7. What audio-visual materials (films, filmstrips/loops, models) are used? What is the extent, frequency and nature of their use by grade level and subject area?
8. By grade level, how much time (in comparison with other subjects) is spent on teaching science?
9. What is the role of the science teacher in working with students? How has this role changed in the past 15 years? What commonalties exist in the

teaching styles/strategies/practices of science teachers throughout the United States?

10. What are the roles of science supervisory specialists at the local district and state levels? How are they selected? What are their qualifications? How have science teachers throughout the United States been influenced in their use of materials by Federally-supported in-service training efforts in science (Weiss, 1978).

For the National Survey of Science, Mathematics, and Social Studies Education a random sample of schools was selected from each of the approximately 400 school districts. All superintendents and supervisors were asked to complete the questionnaires. The principal of each school selected was also asked to answer the questionnaire. In grades K-3 and 4-6, three teachers were selected, (one math, science and social studies teacher). In grades 7-9 and 10-12, the teachers were selected by a stratified random sampling technique based on the subject matter most frequently taught.

The Report of the 1977 National Survey of Science, Mathematics, and Social Studies Education questionnaire covered the following areas: general information, science curriculum, materials, teaching, textbooks, programs and most recent science lesson.

"Section A: General Information:

Attendance at NSF workshops

Teaching experience

College degree

Number of classes taught per week

Section B: Experience with Selected Science Curriculum Materials

Section C: The Science Curriculum in your School

What are your needs regarding assistance from science education resource person.

Section D: Your Science Teaching

Number of students in class

Rating of classroom, equipment, supplies, money, storage space and paraprofessional help.

Use of the metric system

Teaching techniques: lecture, discussion, student reports, library use, use of hands-on, field trips, guest speakers, etc.

Rating audio-visual materials

Use of equipment and materials

Section E: Textbooks and Programs used in this Class

Current textbook or books you are using.

Section F: Your Most Recent Science Lesson in this Class

Use of lecture, discussion, hands-on lessons" (Weiss,1978, p. D1-12).

National Science Foundation Survey Data

The following tables are from the 1977 National Survey of Science, Mathematics, and Social Studies Education which was conducted by the Research Triangle Institute (RTI) under contract to the National Science Foundation (NSF). The tables compare percentages of use of three teaching

techniques, i.e.: lecture, discussion and the use of hands-on methods for grade levels 4-6 and 7-9. In both cases the use of discussion and lecture were the dominate teaching techniques. The tables show only part of the data collected.

TABLE I
DATA OF TEACHING TECHNIQUES
FROM THE 1977 NSF SURVEY
GRADES 4-6

TECHNIQUES	NEVER	LESS THAN ONCE PER MONTH	ONCE PER MONTH	ONCE PER WEEK	ALMOST DAILY	MISSING
Lecture	12	6	9	43	23	8
Discussion	1	1	4	32	58	5
Students use hands-on manipulative or laboratory materials	13	19	25	25	11	8

Note: Data is given in percentages. N = 271. (Weiss, 1978, p. B-61-62).

Table II

DATA OF TEACHING TECHNIQUES
FROM THE 1977 NSF SURVEY
GRADES 7-9

TECHNIQUES	NEVER	LESS THAN ONCE PER MONTH	ONCE PER MONTH	ONCE PER WEEK	ALMOST DAILY	MISSING
Lecture	5	6	9	48	30	2
Discussion	1	2	4	34	56	3
Students use hands-on manipulative or laboratory materials	5	16	17	37	24	2

Note: Frequencies are given in percentages. N = 535.
(Weiss, 1978, p. B-61-62)

Table II from the NSF survey of 1977 shows the percentages of how frequently lecture, discussion and hands-on activities are presented. Lectures were given most frequently on a once per week basis by 48 % of the NSF teachers. Discussion is used almost daily by 56% of the NSF teachers surveyed. The use of hands-on is most frequently used once per week but only by 37% of the NSF teachers surveyed.

In response to the question of students use of hands-on, manipulative, or laboratory materials, in science class, 48% of the science classes K-12 used hands-on once a week or more often. It was noted that "science educators may be concerned that even as many as 9% of the science classes never use manipulatives and another 14% do so less than once a month" (Weiss,1978, p. 107).

The Development of Tulsa Public School System Science Curriculum 1970's-1996

In the early 1970's all of the TPS middle and junior high school science classes were using the Intermediate Science Curriculum Study (ISCS). As quoted from John Roller, former science supervisor for TPS, 1965-1992, "This was a highly hands-on program. It was individualized and self-paced. The textbook was the guide and the teacher the facilitator. The major reason this program was phased out was the expense of the program. The second reason the program was dropped was the fact that the content did not match the objectives of the standardized test. The Iowa test was used to evaluate students on general science concepts. The ISCS program was not a general science

curriculum. The ISCS program was divided into three levels. Level one covered physical science, level two chemistry and level three covered life science. A student would have had to have completed all three levels before having enough background to be able to do well on the standardized Iowa Test" (J. Roller, personal communication, June, 1996).

John Roller continued to say...."After the ISCS years of the early 1970's the development of the science curriculum for Tulsa public middle schools was a decision left up to each science teacher to plan. There was no set organized curriculum. Later in the 1980's committees of science teachers planned the content, scope and sequence of the curriculum for TPS. Today the Priority Academic Student Skills (P.A.S.S.) and the National Science Education Standards have a major role in guiding the development of TPS middle school science curriculum as well as the teachers. The teachers have the freedom of deciding the scope and sequence of their curricula."

"In the 1980's, science teachers were given the freedom to choose their own curriculum. This included the content, scope and sequence as well as how the material would be taught. In the mid 1980's the push was made to develop a spiraling curricula that was built of a continuum of concepts for each grade level to follow. Committees of science teachers wrote curriculum guides in the summer. These guides consisted of the content, scope and sequence, objectives for each grade level and suggested activities and appropriate audiovisuals. The scope and sequence of the content for each grade level was determined by the committee members. The only requirement was the content

be made from all branches of science; a general science curriculum. Due to the high rate of student mobility, all middle schools were highly recommended to follow exactly the scope and sequence of the curriculum to avoid repetition of content" (J. Roller, personal communication, June, 1996).

Donna Kline, a science teacher at TPS, Byrd Middle School, recalled...In 1993 the curricula was revised to include the Priority Academic Student Skills (P.A.S.S.). A problem encountered with this curricula was to find which textbook followed the same objectives as TPS and P.A.S.S. As a result, no textbook followed the curriculum plan exactly. Teachers were able to select any textbook on the state adopted list."

"As of August, 1996, the curricula was again revised. Now the TPS science curricula uses skills from the Priority Academic Student Skills (P.A.S.S.) and concepts from the National Science Education Standards. The major difference in the 1980s curriculum and today's is that the teacher is back in charge of deciding the scope and sequence of the curriculum as it was in the mid 1970's" (D. Kline, personal communication, August 17, 1996).

The effectiveness of this revised and more teacher directed curricula is to be measured by the Criterion Referenced Test. Students are tested in the eighth grade. Criterion Referenced Tests are a series of science tests that measure the Priority Academic Student Skills that have been developed as part of the Oklahoma Student Testing Program. These tests use science process skills to measure how well students can apply science content (Oklahoma State Department of Education, 1994).

"As far as the textbook dilemma goes, today each middle school may choose any textbook that is on the State list of adopted textbooks. Each middle school switched to site-based management, which means the school is given a sum of money for supplies, substitute teachers, textbooks, etc. and the school decides how much money to spend in each area. There is no longer a set science budget. Usually there are more needs than there are funds available. Therefore, in some cases, the science department as well as other departments are short changed and do not have enough funds to purchase textbooks. The matter of purchasing supplies and equipment for science is also a major problem. Often science supplies and equipment are purchased with money from other sources such as fund-raisers and grants" (D. Kline, personal communication, August 17, 1996).

National Science Education Standards

The National Science Education Standards are used in conjunction with the P.A.S.S. objectives in formulating the TPS middle school science curriculum. There are four principles of the National Education Standards. The following principles are quoted from the National Science Education Standards book p. 19-21, 1996.

1. Science is for all students.

2. Learning science is an active process....Learning science is something students do, not something that is done to them....Hands-on activities are not enough-students also must have "minds-on" experiences.... Emphasizing active

science learning means shifting emphasis away from teachers presenting information and covering science topics. The perceived need to include all the topics, vocabulary, and information in textbooks is in direct conflict with the central goal of having students learn scientific knowledge with understanding.... Although the Standards emphasize inquiry, this should not be interpreted as recommending a single approach to science teaching....Conducting hands-on science activities does not guarantee inquiry, nor is reading about science incompatible with inquiry.

3. School science reflects the intellectual and cultural traditions that characterize the practice of contemporary science....Students should develop an understanding of what science is, what science is not, what science can and cannot do, and how science contributes to culture.

4. Improving science education is part of systemic education reform" (National Research Council, 1996, p. 19-21).

The Importance of Outdoor Sites in Environmental Education

The state of the environment has become a major concern in the recent decades of this century. The Exxon Valdez tanker that ran aground in March of 1989 discharging millions of gallons of oil into Prince William Sound and the deforestation of the rain forest are only two examples of the environmental crises that threaten the Earth's ecosystem. The future of the environment lies in the hands of the youth. Students need education in environmental issues.

In the early 1970's environmental curricula was being developed. In 1975

.the Oklahoma State Department of Education printed the booklet Environmental Education Instructional Activities. The overall goal of the booklet was "...to development a citizenry which is environmentally literate and possesses positive attitudes relative to the total environment" (Oklahoma State Department, 1975, p. 3). The booklet stressed by teaching "through the environment," meaningful experiences would develop desired attitudes. The attitude of realizing that the student is in a custodial capacity and their decisions and actions affect the Earth (Oklahoma State Department, 1975, p. 3).

Other governmental departments also provide information on developing outdoor classrooms. The US Department of Agriculture's Soil Conservation Service publishes several booklets on outdoor sites. In the booklet Outdoor Classrooms on School Sites state that outdoor classrooms supplement and stimulate the environmental education program. "As a place for creative learning experiences, it gives depth, meaning, and new dimensions to generalizations about and understandings of man's relation to his environment" (US Department of Agriculture, 1972, p.1). Even at this early time educators recognized that it was not only necessary to include environmental education in the science curricula but to do so outdoors.

In 1990, Ken Riddleberger, who is the Project WILD coordinator of the Georgia Department of Natural Resources Wildlife Resource Division stated in the Georgia Schoolyard Wildlife Habitat Planning Guide, "If teaching about nature is important, then the outdoors is the logical place to do so. Student involved in schoolyard habitat projects have first hand experience in learning

about the environment and develop an attitude of stewardship essential to our future..." (Georgia Forestry Commission, 1990, p. 1).

In summary outdoor classrooms are an integral part of environmental education. Outdoor sites offer direct learning experiences of environmental processes and relationships (Alexander, 1991). Studying in an outdoor site teachers respect for life and stimulates curiosity about nature (Peterson, 1991). Also studying in an outdoor site teaches respect for life and stimulates curiosity about nature (Peterson, 1991).

CHAPTER III

METHODOLOGY

Introduction

The content of this chapter will focus on the research questions, research design and procedures utilized. After this discussion of methodology, the method of analysis of data will conclude this chapter.

Research Questions

It has been nearly twenty years since science teachers nationally were surveyed to determine which teaching method is predominantly utilized. Studies show many teachers continue to use traditional methods to the exclusion of hands-on activities. The purpose of this study is to evaluate middle school science teaching methods in the Tulsa Public School System. This purpose is sub-divided into four research questions.

1. What is the extent to which hands-on teaching methods and traditional methods are currently being utilized?
2. From among a prescribed list of factors which affect teaching conditions, which factors limit or restrict teaching most frequently?
3. Is there a relationship between the teaching method practiced and the number of years of teaching experience?

4. How often is an outdoor site utilized for environmental teaching purposes?

Survey

A self-report questionnaire developed for this research project was used to collect data. The questionnaire is similar in content to the National Survey of Science, Mathematics, and Social Studies Education of 1977, by The Center for Educational Research and Evaluation Research Triangle Park. The questionnaire was comprised of the following four sections:

Section A: Educational background of the teacher

Section B: Teaching Information and Experience

Section C: Teaching Conditions

Section D: Environmental Education

Section A investigated the educational background of the teacher. Questions concerning highest degree earned, number of college hours in science courses and area of minor degree were asked.

Section B focused on teaching experience. Questions concerning grade level of certification or endorsement, teaching experience, workshop attendance, and classroom adequacy were covered.

Section C examined how often certain factors limit or restrain teaching. Some of the factors listed included: equipment and material needs, budget restraints, discipline problems and intercom interruptions. Next teachers were asked how much class time students use the textbook, are involved in paper and pencil work and hands-on activities. The last question investigated how

much time is spent by the teacher in lecturing, discussing, using guest speakers, audiovisual materials, going on field trips and dealing with discipline problems.

Section D asked questions concerning the use of an outdoor site for science teaching purposes. Questions of usage, curriculum topics, and types of outdoor activities were surveyed.

The Likert scale was used to determine frequency. Teachers were asked to check one of five time periods that best described their situation. The time periods were: never, less than once a month, at least once a month, at least once a week and just about daily.

To determine deficiencies and suggestions for improvement of the proposed survey, three Oklahoma State University professors were asked for recommendations. After revision the proposal was submitted to and approved by the Oklahoma State University Institutional Review Board. (Appendix E) The questionnaire was then sent through the school mail to all of the middle school science teachers of the Tulsa Public School System. (Appendix A)

Population

The population for this survey is that of sixth, seventh and eighth grade middle school science teachers currently employed in the Tulsa Public School System. The current list of TPS middle school science teachers shows 70 individuals, however due to changes in teaching assignments and teachers absent on leave the population decreased to 64 teachers.

Research Design and Procedure

The data for this study were collected using a self report questionnaire. (Appendix A) A modified Dillman format was utilized in delivering the questionnaire. The survey was mailed to TPS middle school science teachers on Tuesday, April 2, 1996. Accompanying this was a cover letter which included a brief description of the purpose and significance of the questionnaire. The letter also stressed to each recipient the importance of their indivIdual input to the overall survey, and the importance of responding as soon as possible, and that complete confidentiality would be assured. Teachers were also given an opportunity to receive the results of the survey.

The surveys were sent through the school mail to each middle school science teacher. Each recipient was asked to return the questionnaire by April 29, 1996. Three weeks after the initial mailing date, a reminder letter was sent to lessen the chance of nonresponse. (Appendix B)

Since the entire population was surveyed the results of the survey reflect the experience and opinions of the entire population more accurately than a sample of the population would have. However, there is always the potential of nonresponse in a self-report study which would affect the results gathered from the total population. Therefore to lessen the chance of nonresponse, those who did not respond to the reminder letter were contacted by phone and encouraged to send in their results.

Analysis of Data

The results of the survey were manually coded and then entered into an IBM 3090 computer at Oklahoma State University's Computer Center. All data analysis was conducted using the Statistical Package for the Social Sciences (SPSS). The statistical data obtained from the survey were in the form of frequency distributions and percentages. Also the significance of variables from the survey were measured using chi square. The level of significance selected for this project was alpha equal to .05.

CHAPTER IV

ANALYSIS OF THE SURVEY

Introduction

This chapter first briefly describes the population surveyed, questionnaire, and the purpose of the survey. Secondly the results of the survey as well as comparisons between survey questions are discussed. The chapter concludes with comparisons made between the 1977 NSF survey and the 1996 TPS survey.

Sample, Questionnaire and Purpose of Survey

The sample population surveyed in the study was comprised of the entire population of middle school science teachers in the Tulsa Public School System. The survey asked questions focusing on educational background, experience and methods of teaching and frequency as related to use of an outdoor site. A purpose of this study was to evaluate middle school science teaching methods in the Tulsa Public School System. As evidenced by the following this purpose is sub-divided into four research questions.

1. What is the extent to which hands-on teaching methods and traditional methods are currently being utilized?
2. From among a prescribed list of factors which affect teaching conditions, which factors limit or restrict teaching most frequently?

3. Is there a relationship between the teaching method practiced and the number of years of teaching experience?
4. How often is an outdoor site utilized for environmental teaching purposes?

The results of the survey were manually coded and then entered into an IBM 3090 computer at Oklahoma State University's Computer Center. All data analysis was conducted using the Statistical Package for the Social Sciences (SPSS). The statistical data generated from the survey were in the form of frequency distributions and percentages. Also the significance of variables from the survey were measured using chi square. Forty-eight teachers (75%) out of 64 teachers responded to the survey and follow-up letters.

Results of the TPS Survey

The following are the results of the Tulsa Public Middle School Science Teacher Survey. After each survey question the teachers' responses are given in table form showing the frequency distribution. Graphic representations are also given over the more pertinent data. All percentages are based on N=48 unless indicated otherwise.

Section A: Educational Background

1. What is the highest degree you hold?

   A. Bachelor's
   B. Bachelor's plus _____
   C. Masters
   D. Masters plus 30
   E. Masters plus 60
   F. Doctorate
   G. Doctorate plus

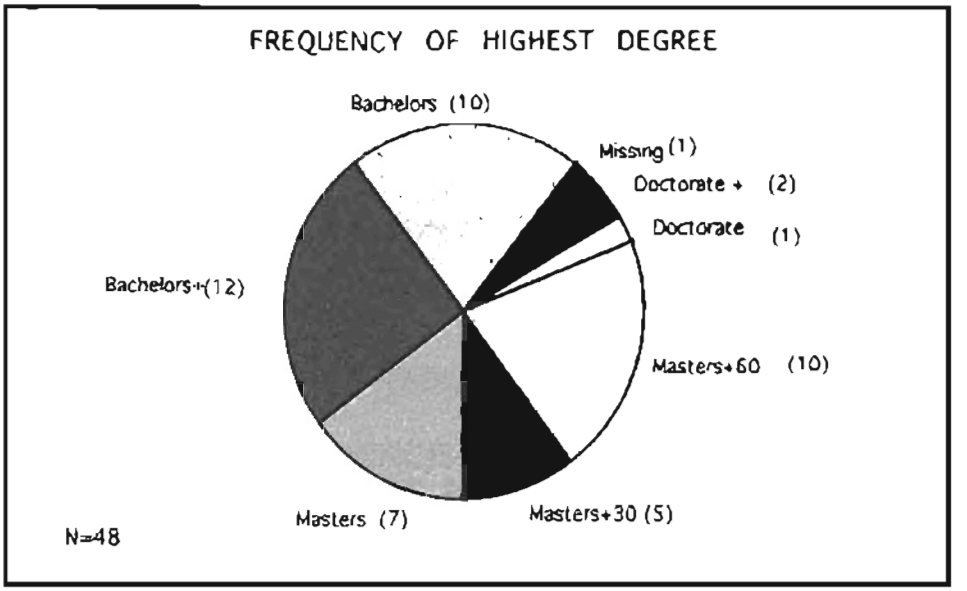


Figure 1. Frequencies of Highest Degree Held by TPS Middle School ScienceTeachers

Figure 1 shows the frequency of the highest degree earned by TPS middle school science teachers. Most teachers hold a masters degree or higher (52.08%). There are 12 teachers (25%) who have their bachelors degree plus additional credit hours. There are three teachers (6.25%) who have a doctoral degree or a doctorate plus additional hours.

2. Approximately how many undergraduate or graduate college hours do you have in science courses?

TABLE III

FREQUENCIES OF COLLEGE HOURS OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

HOURS	FREQUENCY
76-100+	12
51-75	5
26-50	14
0-25	11

Table III shows the frequency groupings for the number of college credit hours obtained in science courses. The range was from 0 to 100+ hours with a mean of 44.73 hours. (Appendix C)

3. What is your area of concentration or in what area do you hold a minor degree?

TABLE IV

FREQUENCIES OF AREAS OF MINOR DEGREES OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

AREA OF MINOR DEGREE	FREQUENCY
Non-Science & Science	2
Non-Science	7
Science	35
Missing	4

Note: N = 44.

The data from Table IV is based on 44 out of the 48 teachers surveyed due to nonresponse. There are 35 teachers (79.54%) have a minor degree or area of concentration in science. Only seven teachers (15.9%) do not have a minor or area of concentration in science.

Section B: Teaching Information And Experience

4. In what grade levels are you certified or have an endorsement to teach science?

A. K-6 B. 7-12 C. K-6 + Endorsement

D. 7-12 + Endorsement E. None

TABLE V

FREQUENCIES OF GRADE LEVEL CERTIFICATION OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

GRADE LEVEL OF CERTIFICATION OR ENDORSEMENT	FREQUENCY
Grades K-6	4
Grades 7-12	25
K-6 + Endorsement	8
Grades 7-12+ Endorsement	10
None	-
Missing	1

Note: A dash indicates no response was reported.

Table V shows the frequencies of grade levels in which teachers are certified or hold an endorsement. Most teachers, 35 (72.91%), are qualified to teach grades 7-12 with or without an endorsement. Twelve teachers (25%) are qualified to teach grades K-6 with or without an endorsement.

5. In what science subjects are you certified or have an endorsement to teach?

A. General Science B. Life C. Earth D. Physical E. None

TABLE VI

FREQUENCIES OF SUBJECT OR AREA OF ENDORSEMENT OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

SUBJECT AREA OR ENDORSEMENT	FREQUENCY
General Science Areas	46
Physical Sciences	1
Life Sciences	1
Earth Sciences	-

Note: A dash indicates no response was reported.

Table VI reports on the frequencies of subject areas of certification or an endorsement. Out of the 48 teachers surveyed, 46 teachers (95.8%) are

qualified to teach general science. Only two teachers (4.2%) are qualified to teach just physical science or life science.

6. How many years have you been teaching?

1. 5 or less 2. 6-10 3. 11-15 4. 16-20 5. over 20

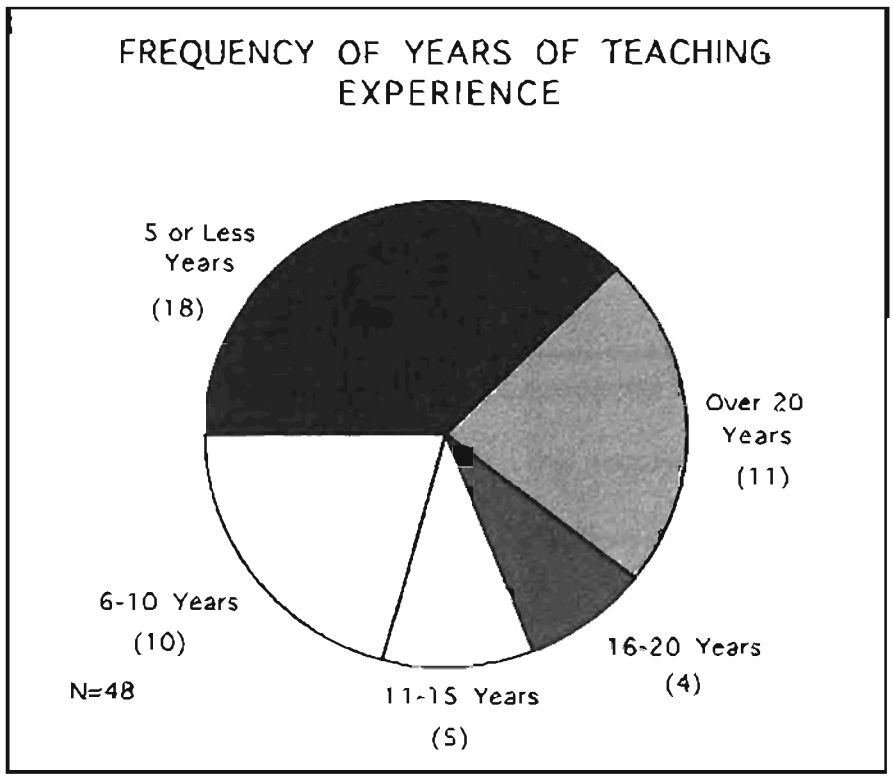


Figure 2. Frequency of Years of Teaching Experience of TPS middle school science teachers

Figure 2 shows the frequencies for years of teaching experience. The largest group consists of 18 teachers (37.5%) who have been teaching 5 years or less. There are eleven teachers (22.9 %) who have been teaching more than twenty years.

7. How many years have you taught science curriculum in any grade level?

1. 5 or less 2. 6 to 10 3. 11 to 15 4. 16 to 20 5. over 20

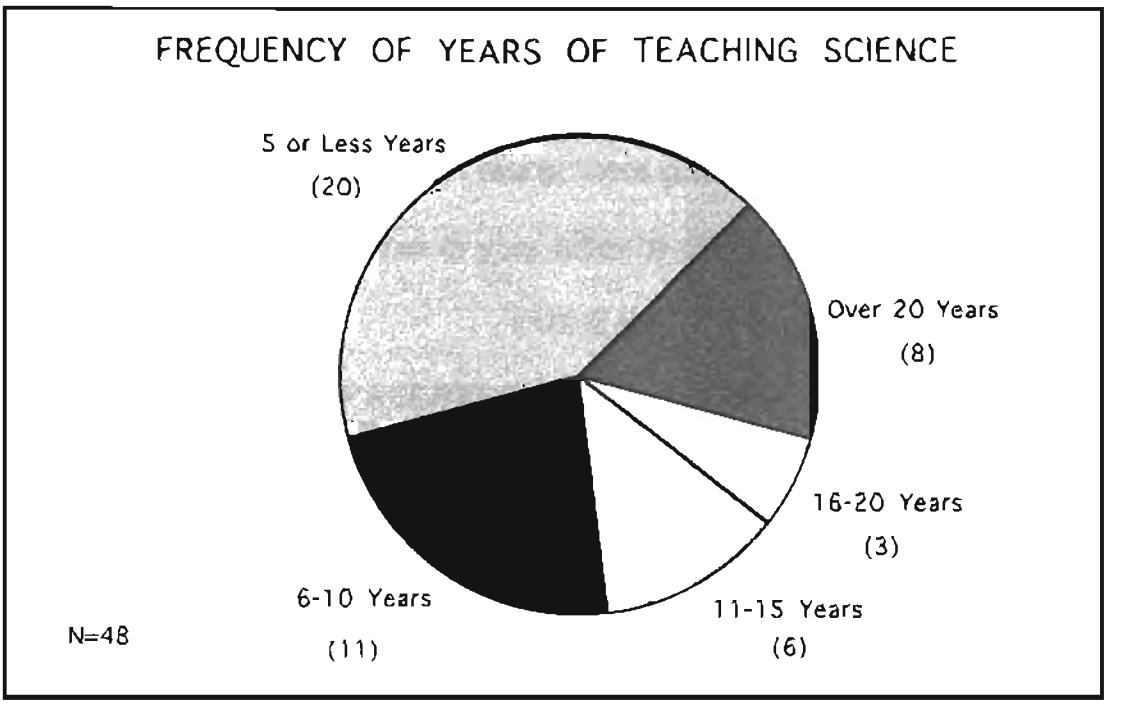


Figure 3. Frequency of Years of Teaching Experience in Science

In contrast to Figure 2, this figure shows the frequencies of years of experience in teaching only science. Of the teachers surveyed, as many as 20 (41.7 %) have been teaching science only five years or less. There are only eight veteran teachers (16.7 %) who have been teaching science over twenty years.

8. What grade or grades are you currently teaching? _____

TABLE VII

FREQUENCIES OF GRADE LEVELS TAUGHT BY TPS MIDDLE SCHOOL SCIENCE TEACHERS

GRADE LEVEL	FREQUENCY
Sixth, Seventh & Eighth	6
Seventh & Eighth	5
Sixth and Seventh	3
Eighth	12
Seventh	9
Sixth	13

Most teachers, 70.83%, teach one grade level. Only 29.16% of the teachers have an assignment of two or more grade levels.

9. What is the average size of your science classes? _____

TABLE VIII

FREQUENCIES OF AVERAGE NUMBER OF STUDENTS PER CLASS OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

AVERAGE NUMBER OF STUDENTS PER CLASS	FREQUENCY
35	1
34	1
32	1
31	1
30	8
28	19
27	2
26	4
25	4
24	1
23	1
22	2
21	1
20	2

Table VIII shows the frequencies of class size. Class size ranges from 20 to 35 students. The mode is 28 students (39.6 %). There are 12 teachers (25%) who have on the average more than 28 students per class. There are 17 teachers (35.41%) who have less than 28 students for an average class size.

10. How many <u>science</u> classes do you teach per day? _____

TABLE IX

FREQUENCIES OF SCIENCE CLASSES TAUGHT PER DAY OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

NUMBER OF SCIENCE CLASSES PER DAY	FREQUENCY
6	6
5	31
4	9
3	2

This table reports on the number of science classes taught per day. The range of science classes taught per day is from three to six. The mode is five classes per day. Over half of the teachers surveyed (64.6%) teach five science classes per day.

11. What areas of science curriculum do you teach?

1. Earth 2. Life 3. Physical 4. General Science 5. Other _____

TABLE X

FREQUENCIES OF SCIENCE CURRICULUM TAUGHT BY TPS MIDDLE SCHOOL SCIENCE TEACHERS

SCIENCE CURRICULUM TAUGHT	FREQUENCY
Combination of 2	17
General	23
Physical	3
Life	3
Earth	2

Table X indicates the frequencies of the branches of science curriculum being taught. The Tulsa Public Schools science curriculum is made up of the general sciences which is a blend of physical, life, earth and space sciences for

grades sixth though eighth. Most of the teachers (83.3 %) follow a general science curriculum or a combination of these. Only eight teachers teach only one of the three science disciplines.

12. How many science workshops do you attend per year?

1. none 2. one to two 3. three to four 4. five or more

TABLE XI

FREQUENCIES OF WORKSHOP ATTENDANCE PER YEAR OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

NUMBER OF WORKSHOPS ATTENDED PER YEAR	FREQUENCY
Five or More	11
Three or Four	21
One or Two	14
None	2

Table XI reports on the frequencies of workshop attendance per year. Most of the teachers (21 teachers, 43.8%) attend three or four science workshops per year. As many as 14 teachers (29.2%) attend one or two science workshops per year. Eleven teachers (22.9%) reported attending five or more science workshops per year. Only two teachers (4.2%) do not attend any science workshops per year.

13. How adequate is your classroom equipped for teaching science, i.e. storage, running water, size, etc.?

1. Poor 2. Fair 3. Good 4. Excellent

TABLE XII

FREQUENCIES OF SCIENCE CLASSROOM ADEQUACY OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

ADEQUACY OF SCIENCE CLASSROOM	FREQUENCY
Excellent	8
Good	8
Fair	23
Poor	8
Missing	1

Table XII shows the frequencies of science classroom adequacy. As many as 31 teachers (64.58%) indicated their classrooms are in fair to poor condition for teaching science. Another 16 teachers (33.3%) rated their classrooms as good to excellent!

Section C: Teaching Conditions

The following table shows the frequencies of factors that limit or restrain teaching effectiveness. The list of factors was compiled from personal experiences and comments from colleagues.

TABLE XIII

FREQUENCIES OF FACTORS THAT LIMIT TEACHING OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

Factors that Limit or Restrain Teaching	Never	Less than once a month	Once a month	Once a week	Almost daily
• Equipment & material needs	3	3	13	12	16
• Appropriate training	21	21	3	-	1
• Lack of support from principal	29	9	2	2	4
• Student textbook allocation	12	2	4	5	25
• Budget restraints	4	4	10	6	24
• Length of class time	9	10	9	13	6
• Class size	4	10	6	9	19
• Inclusion students	19	5	5	5	14
• Intercom interruptions	8	11	2	17	10
• Inadequate planning period time	16	6	8	11	6
• Coverage of teachers' classes due to lack of substitute teacher	2	4	25	13	3
• Liability	8	16	12	3	6
• Discipline problems	2	9	3	10	24
• P.A.S.S. Objectives	16	8	7	6	8
• District objectives	11	9	8	9	8
• Suffering from teacher burnout	18	11	11	3	4
• Other	-	2	1	3	2

Note: A dash indicates no response was reported.

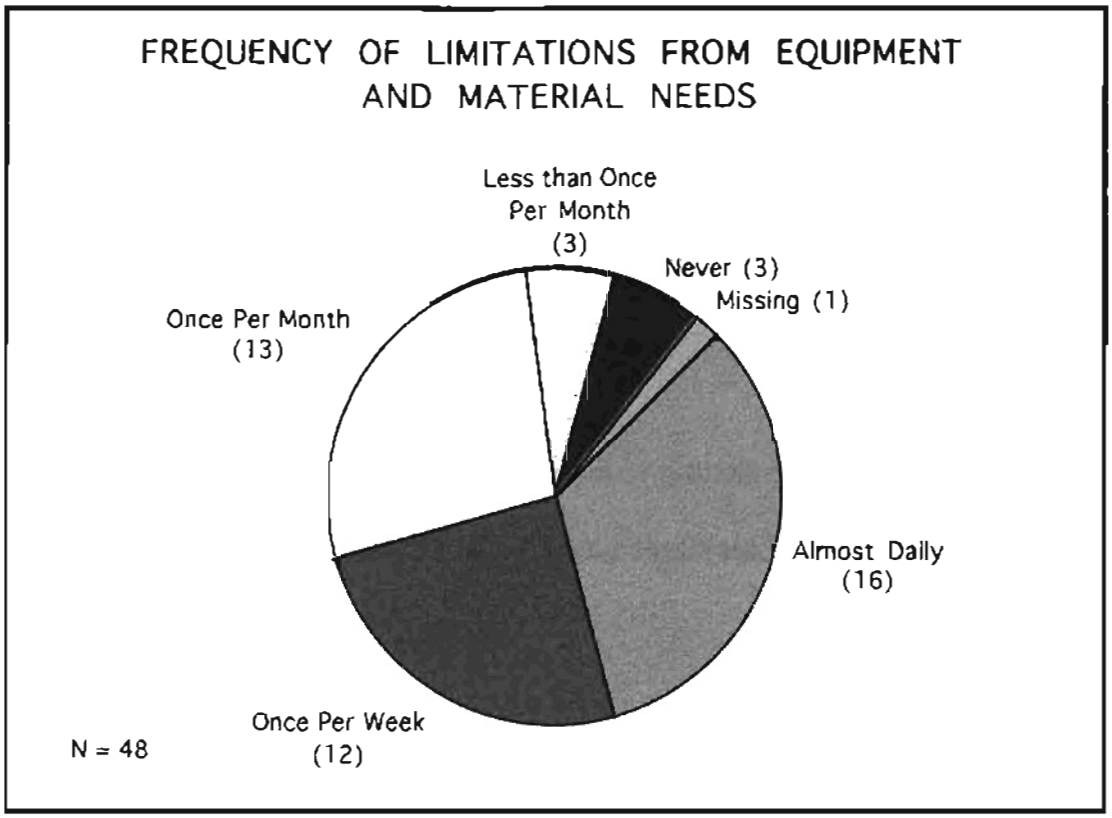


Figure 4. Frequency of Limitations from Equipment and Material Needs of TPS Middle School Science Teachers

Equipment and Material Needs

Figure 4 shows frequencies for equipment and material needs. There is a definite problem of insufficient science equipment and materials for most of the teachers surveyed. As many as 16 teachers (33.33%) encounter equipment and material needs on an almost daily basis. Only three teachers (6.25%) never have equipment or material needs and only 13 teachers (27.08%) experience this situation less than once per month. The remainder of the teachers encounter this problem more frequently.

Appropriate Training

Acquiring appropriate training to teach science does not pose a problem for most of the teachers surveyed. As many as 21 teachers (43.75 %) encounter this difficulty less than once a month or not at all. Just one teacher (2.08%) feels deficient in training on a daily basis.

Lack of Support from Principal

Lack of support from the principal is never a limiting factor for most of the teachers (60.41%) surveyed. However, four teachers (8.33%) found this to be a problem on an almost daily basis.

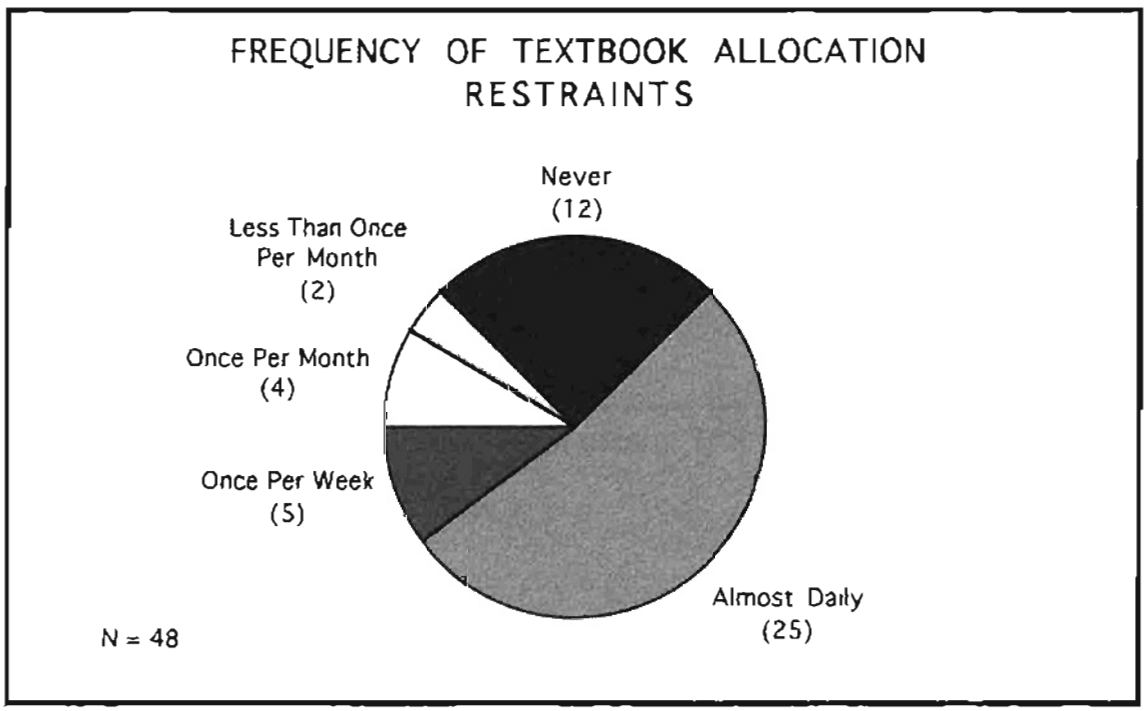


Figure 5. Frequencies of Textbook Allocation Restraints of TPS Middle School Science Teachers

Student Textbook Allocation

Student textbook allocation is definitely a problem on a daily basis for 25 of the teachers (52.08%) surveyed. On the opposing end, one fourth of the teachers never have a textbook allotment shortage or, if they do, it is less than once per week or as infrequent as less than once per month.

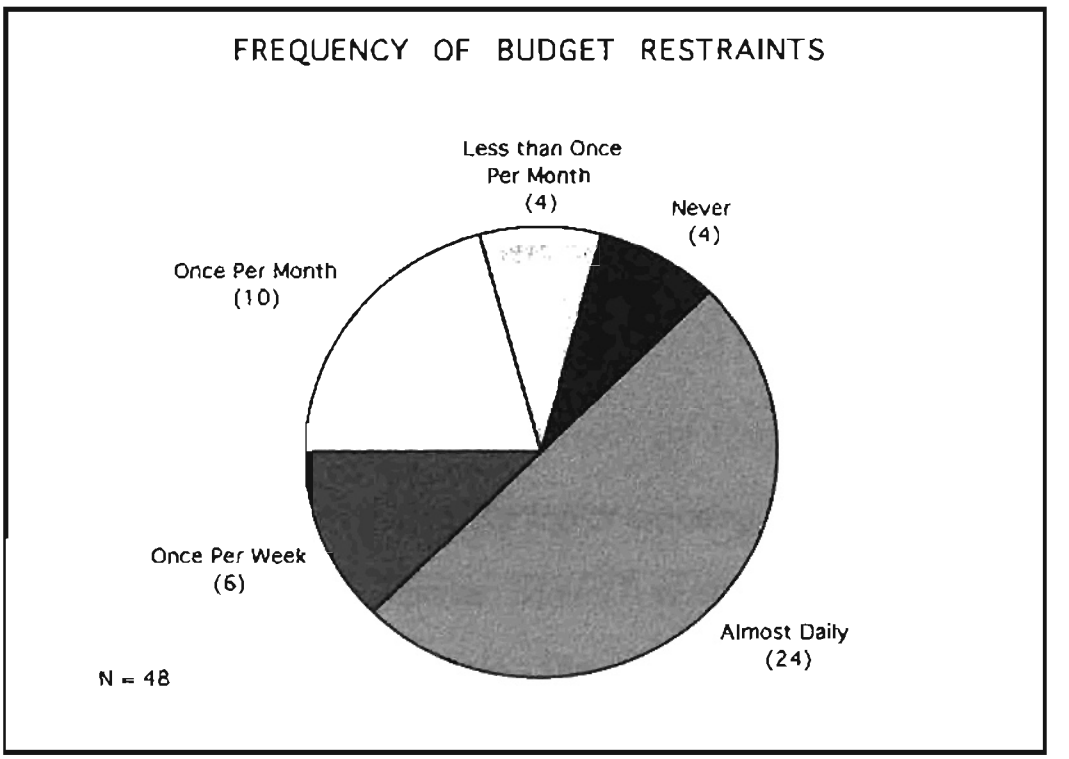


Figure 6. Frequency of Budget Restraints of TPS Middle School Science Teachers

Budget Restraints

The schools' allocated expenditure for science supplies, equipment, etc. is a substantial issue. As many as 24 teachers (50%) encounter this problem daily. Only four teachers (8.33%) are never restricted by the schools' budget.

Length of Class Time

Most teachers feel class time does restrict their teaching effectiveness. The highest frequency occurred in the "once a week" category for 13 teachers (27.08%). Another nine teachers (18.75%) never experience class length problems.

Class size

Most teachers indicated class size as being a limiting factor. As many as 19 teachers (39.58%) feel their classes are too large for science instruction on an almost daily basis. Only four teachers never experience class size problems.

Inclusion students

Inclusion is a means of mainstreaming or including students with learning disabilities (LD) into the core classes. Often LD students require more time and more assistance than regular students. The data is split between inclusion being an almost daily occurrence for 14 teachers (29.16%) to never a problem for 19 teachers (39.58%). However 58.33% are inconvenienced by inclusion once a month or less.

Intercom interruptions

Most teachers are bothered with intercom interruptions. These disturbances occur almost daily for 10 teachers (20.83%), and once per week for 17 teachers (35.41%). A group of 11 teachers (22.91%) are bothered with interruptions from

the intercom less than once per month. Only eight teachers (16.66%) never experience intercom interruptions.

Inadequate planning period time

For some teachers the amount of planning period time is an issue. Of the 48 teachers surveyed 17 (35.41) felt they need more planning time on an almost daily or once per week basis. Another 14 teachers (29.16%) reported this is a problem only once a month or less than once per month. A third of the teachers indicated never having an inadequate amount of planning time.

Coverage of teachers' classes due to lack of substitute teacher

The problem of acquiring substitutes is a problem in the TPS district. When a substitute cannot be arranged, other teachers are asked to cover the absent teachers' classes during their planning period. Only two teachers never experience this problem and as many as 25 teachers (52.08%) cover classes once per month.

Liability

The likelihood of being sued poses a problem on an almost daily basis for six teachers (12.50%). As many as 12 teachers (25%) feel this is a threat once per month and 16 teachers (33.33%) feel threatened less than once per month. Only eight teachers (16.66%) never are concerned with liability.

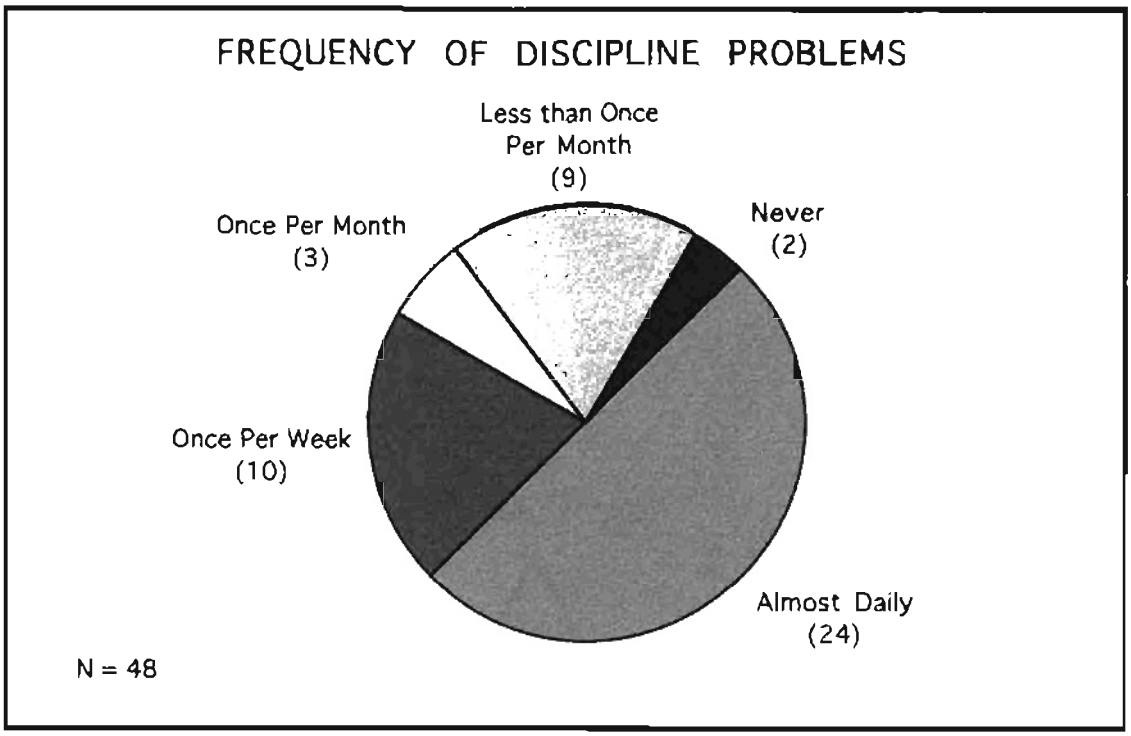


Figure 7. Frequencies of Discipline Problems for TPS Middle School Science Teachers

Discipline Problems

Figure 7 indicates the frequency of discipline as being a restriction on teaching. Discipline is a major problem for 70.83% of the teachers on an almost daily or once per week time frame. On the other hand, as many as nine teachers (18.75%) encounter behavior problems less than once per month. Only two teachers (4.16%) of the 48 surveyed never experience discipline problems.

P.A.S.S. Objectives

The frequency of teachers dealing with the Priority Academic Student Skills (P.A.S.S.), objectives is fairly evenly distributed. As many as 29 teachers

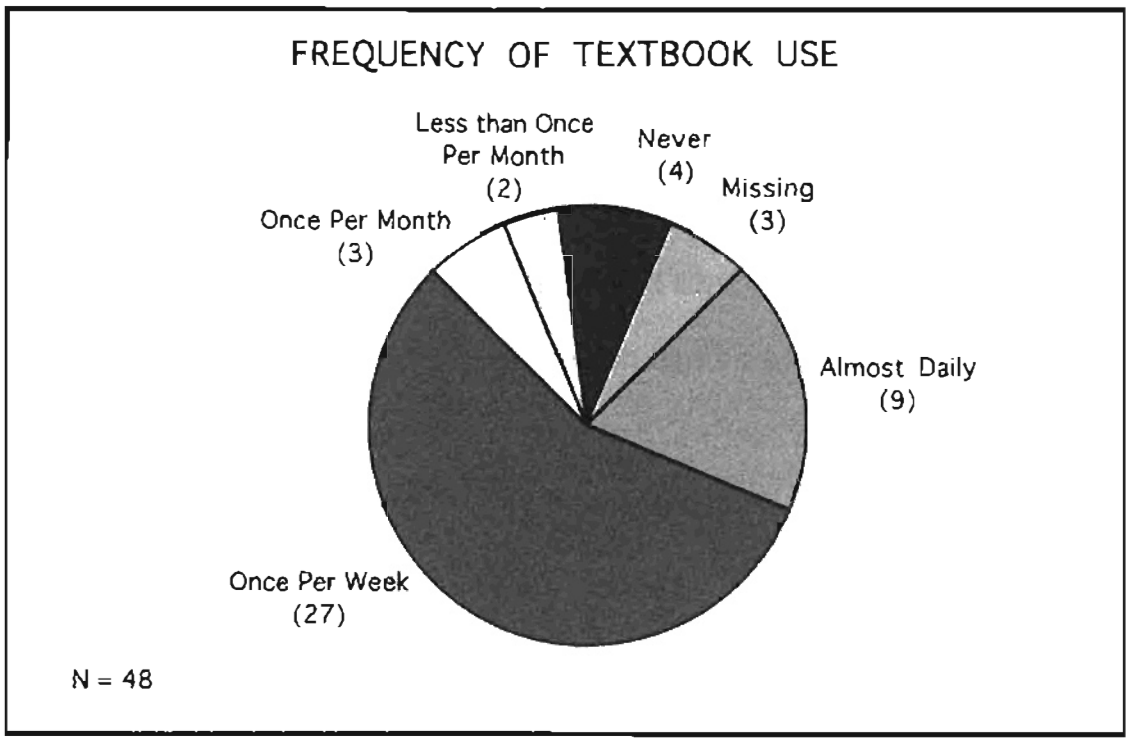


Figure 8. Frequencies of Textbook Use by TPS Middle School Science Teachers

Textbook

Reading assignments, and other book related work is frequently used in science classes. As many as 27 teachers (56.25%) use the textbook at least once a week and nine teachers (18.75%) use a textbook almost daily. There are only four teachers (8.33%) who never use the textbook.

Students' Frequency of Time spent on Tasks

The next section of the survey reports on how often students are involved in the following tasks: textbook use, hands-on activities, paper and pencil work, lecture and discussion, use of computers and library usage. The intent of this section was to determine how frequently students were involved in traditional and a hands-on assignments.

TABLE XIV

FREQUENCIES OF TIME SPENT ON TASK BY TPS MIDDLE SCHOOL SCIENCE STUDENTS

15. How much time is spent by STUDENTS doing each of the following:	Never	Less than once a month	Once a month	Once a week	Almost daily
• Textbook: i.e. reading assignments	4	2	3	27	9
• Paper & pencil work: i.e.: answering questions, worksheets, defining vocabulary words, outlining chapters, etc.	2	1	1	23	21
• Hands-on activities: i.e.: use of manipulatives, experimenting, using lab materials, etc.	-	3	10	26	9
• Use of computers	29	12	4	1	1
• Use of library: i.e. research, reports, etc.	8	28	10	2	-
• Other:	-	2		4	-

Note: A dash indicates no response was reported.

(60.41%) are concerned with these objectives at some time. There are 16 teachers (33.33%) who never have a problem with the P.A.S.S. objectives.

District Objectives

A similar pattern occurs with the Tulsa Public Schools' science objectives as it did with the P.A.S.S. objectives. Most teachers (72.91%) have a problem with the objectives at some time. There were 11 teachers (22.91%) who never experience difficulty in completing the objectives.

Suffering from Teacher Burnout

Only 18 teachers (37.50%) indicated never being concerned with teacher burnout. Of those who do experience burnout, four teachers (8.33%) reported almost daily occurrences and three teachers (6.25%) weekly. As many as 11 teachers (22.91%) indicated feelings of burnout less than once per month and once per month.

Other Factors that Restrict or Limit Teaching

Only eight teachers (16.66%) reported "other" factors that restrict their teaching. These factors were heat in room, time and meetings. The comment concerning heat refers to too much heat in the room on a daily basis. This room is located over a boiler room and is uncomfortable all year round. Time is another concern for teachers. The problem lies in not having enough time to complete all of the daily tasks. Also teachers are involved in numerous meetings throughout the week which steal precious planning time.

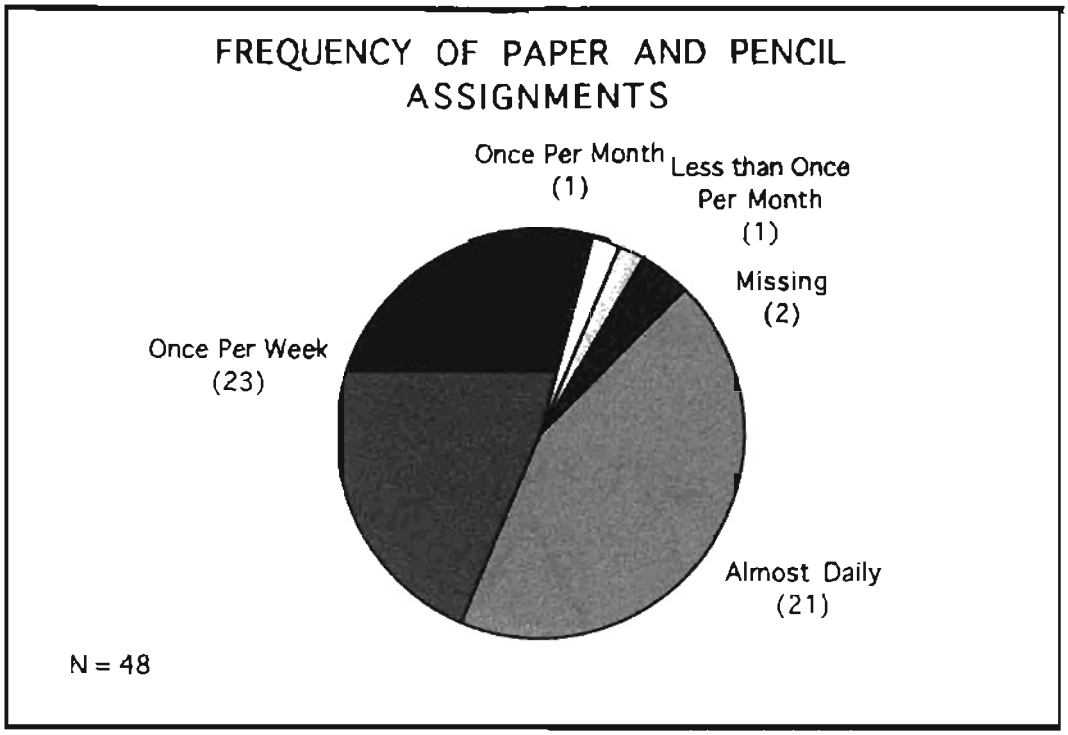


Figure 9. Frequencies of Paper and Pencil assignment

Paper & Pencil Work

A large number of teachers often give written work. These range from answering questions, filling out worksheets, defining vocabulary words and outlining chapters, etc. As many as 21 teachers (43.75%) give written work on an almost daily basis and 23 teachers (47.91%) give these assignments once per week. On the other hand, only two teachers (4.16%) never give paper and pencil assignments.

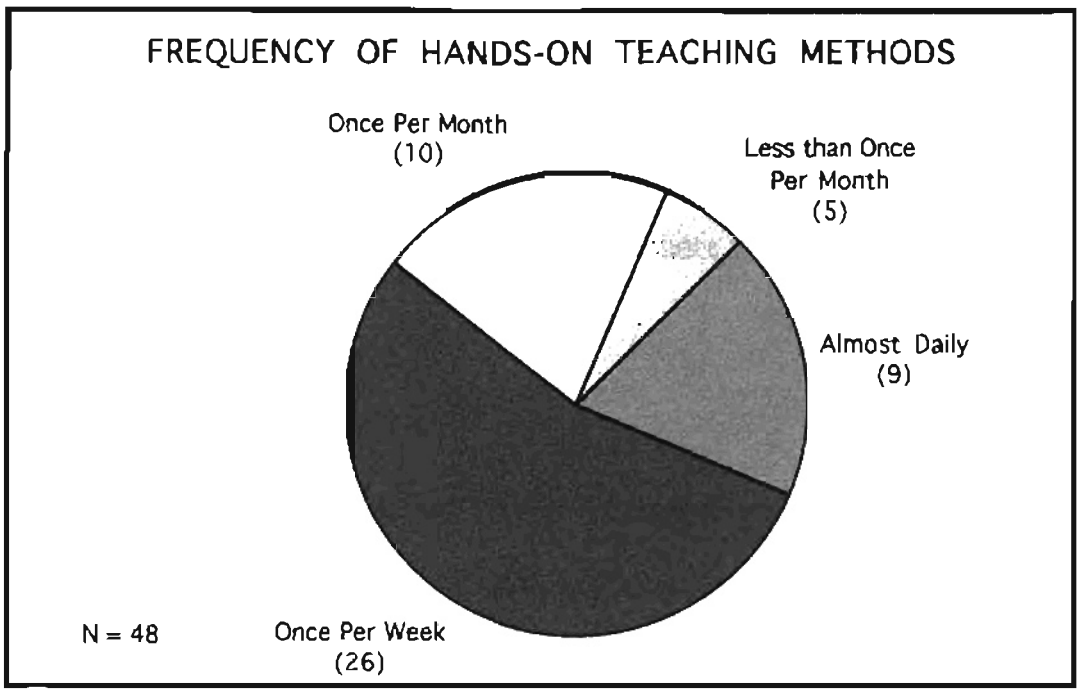


Figure 10. Frequencies of Hands-on Teaching Methods for TPS Middle School Science Teachers

Hands-on Activities

As the graph illustrates, most teachers (72.91%) use hands-on teaching methods on an almost daily or once per week bases. As many as 26 teachers (54.16%) use hands-on methods once per week. Only three teachers (6.25%) use hands-on less than once per month.

Use of Computers

Only one teacher reported the utilization of computers on a daily basis. One fourth of the teachers surveyed use computers less than once per month. As many as 29 teachers (60.41%) never use computers in their classrooms.

Use of Library

The most frequent use of the library is less than once per month by 28 teachers (58.33%). Another ten teachers (20.83%) reported library usage to be as seldom as once per month and eight teachers (16.66%) never make use of the library.

Other

Very few teachers reported on "other" tasks with which students are involved. Only four teachers (8.33%) indicated other items which occur as often as once per week. These comments pertain to the teacher and not the students' use of time. The few comments reported involved time spent by teachers for duties such as monitoring halls, cafeteria and buses.

TABLE XV

FREQUENCIES OF TIME SPENT BY TPS MIDDLE SCHOOL SCIENCE TEACHERS DOING VARIOUS TASKS

16. How much of the time is spent by you the **TEACHER**, doing each of the following?	Never	Less than once a month	Once a month	Once a week	Almost daily
• Lecturing and discussing	-	-	3	16	29
• Use of guest speakers	4	32	12	-	-
• Field trips	13	34	1	-	-
• Use of audiovisual materials: i.e.: videos, laser disc, films, slides, etc.	-	5	14	21	8
• Discipline problems	3	8	3	9	25
• Other:	-	-	1	-	3

Note: A dash indicates no response was reported.

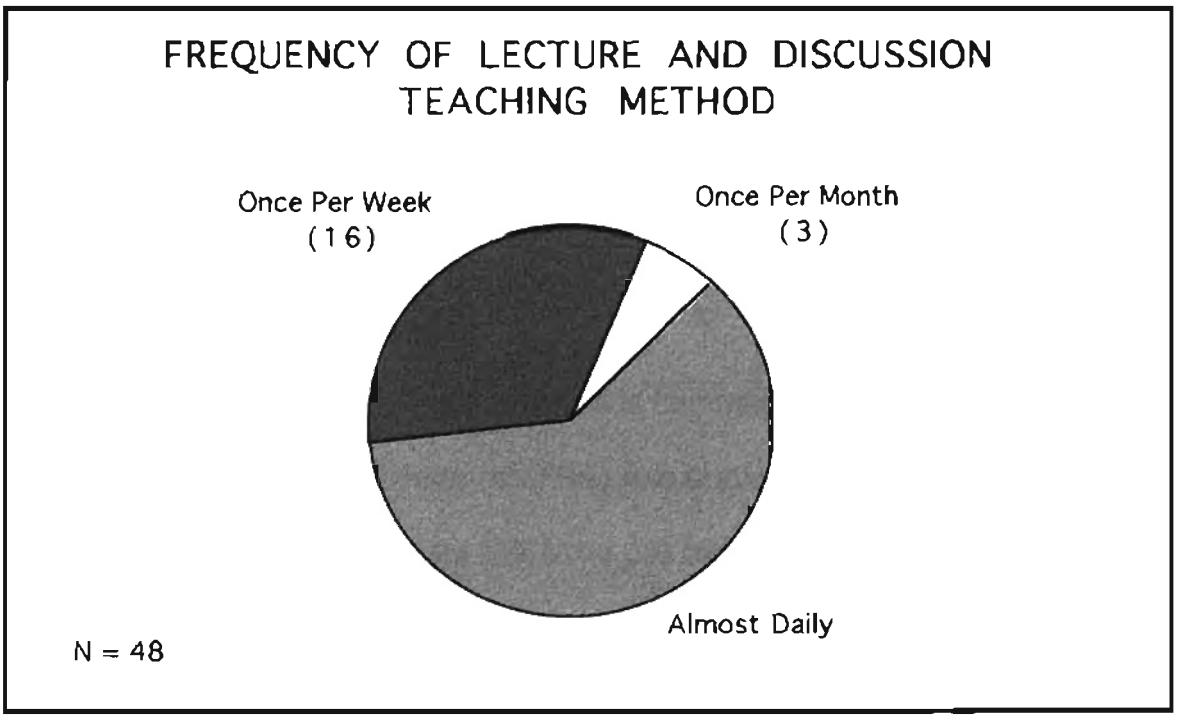


Figure 11. Frequency of Lecture and Discussion Teaching Methods of TPS Middle School Science Teachers

Lecturing and Discussing

Lecturing and discussion methods are frequently exercised by TPS science teachers. As many as 45 teachers (93.75%) use this method on an almost daily or once per week basis. Only three teachers (6.25%) reported using lecture methods only once per month.

Use of Guest Speakers

As many as 32 teachers (66.66%) utilize guest speakers less than once per month whereas another one fourth of the teachers use speakers once per month.

Field trips

Most teachers (34 or 70.83%) take advantage of field trips less than once per month. As many as 13 teachers (27.08%) indicated they never make use of field trips.

Use of Audiovisual Materials

The utilization of audiovisual material is commonly practiced by teachers on a regular basis. Most teachers (43.75%) use audiovisual equipment once per week and another 14 teachers (29.16%) use this equipment once per month.

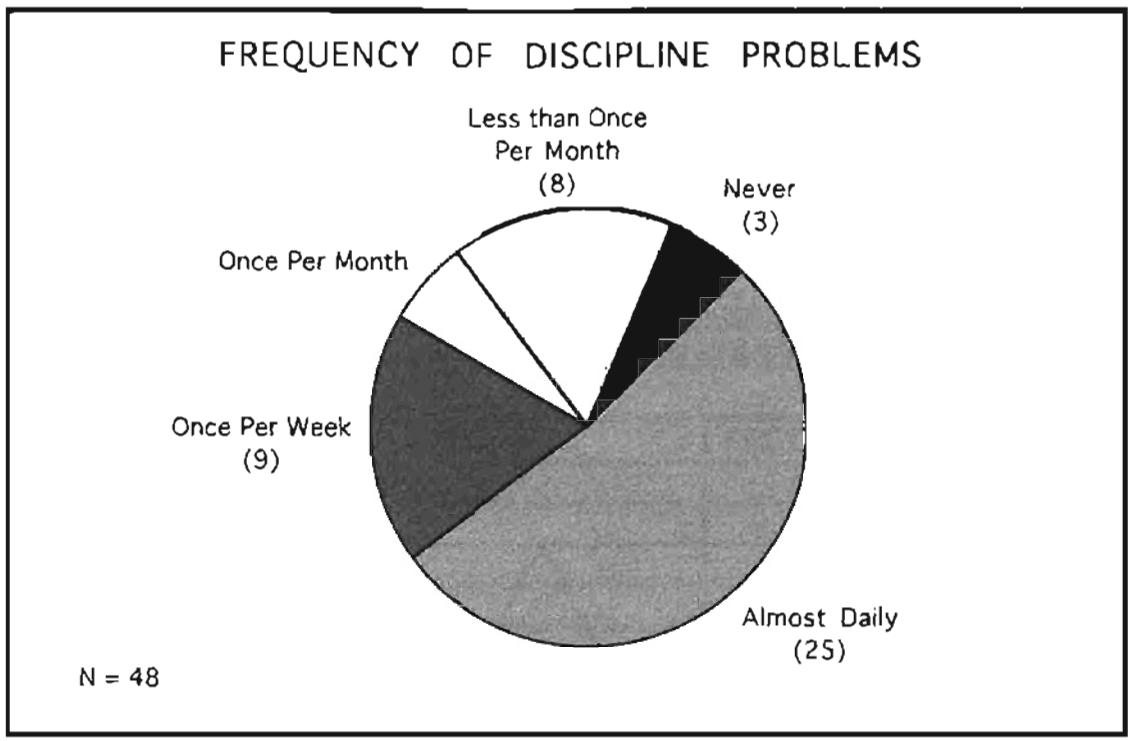


Figure 12. Frequencies of Discipline Problems of TPS Middle School Science Teachers

Discipline Problems

Difficulty in maintaining discipline is a serious problem of the TPS teachers surveyed. As many as 34 teachers (70.83%) reported discipline as a major issue on an almost daily or once per week basis. Only three teachers (6.25%) never have discipline concerns and eight teachers (16.66%) have problems less than once per month.

Other

One other time consuming job reported by teachers on the survey was dealing with paper work. This was ranked as being an almost daily concern by three teachers of the four who reported on "Other" concerns.

Section D: Environmental Education

17. Is an outdoor site available for teaching science?

a. Yes b. No c. Sometimes

TABLE XVI
FREQUENCIES OF OUTDOOR SITES AVAILABILITY FOR TPS MIDDLE SCHOOL SCIENCE TEACHERS

SITE AVAILABILITY	FREQUENCY
Sometimes	7
No	24
Yes	17
Missing	0

Table XVI illustrates the frequency of teachers who have an outdoor site available for science teaching. The data show that 17 teachers (35.41%) answered "Yes" they have an outdoor site and seven teachers (14.58%) answered an outdoor site is available only sometimes. Twenty four teachers (50%) indicated not having any outdoor site. It is interesting to note that 50% of the teachers have access at some point to an outdoor site and 50% do not have any access to an outdoor site. The seven teachers who responded to choice c. "Sometimes," may have misinterpreted the intended meaning of this response. This choice was intended to mean occasional or limited access to an outdoor site. Teachers often share an outdoor site with other teachers in the same building or another school. The site may become too crowded with students to provide a suitable outdoor teaching environment and therefore have limited availability. An outdoor site to some teachers may be a special area of the school grounds set aside for science class use, when in fact, part of the soccer

field could be interpreted by other teachers as an outdoor site. Teachers surveyed may have drawn a distinction between actually using an established outdoor classroom and taking their classes out-of-doors.

18. Does the school cooperate in providing an outdoor site for science use only?

    a. Yes b. No c. Sometimes

TABLE XVII

FREQUENCIES OF OUTDOOR SITES FOR SCIENCE USE OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

COOPERATION OF SITE	FREQUENCY
Sometimes	7
No	29
Yes	9
Missing	3

Table XVII shows that of the 45 teachers who responded to the survey, only nine or 18.75% have an outdoor site set aside just for science class use. Only seven teachers (14.58%) indicated having a site available at sometime. After comparing the 24 teachers who indicated they do not have an outdoor site to the 29 teachers who answered "No," a site is not set aside just for science use, five teachers possibly do not have an outdoor site just for science use.

TABLE XVIII
USE OF ENVIRONMENTAL TOPICS BY TPS MIDDLE SCHOOL SCIENCE TEACHERS

19. Circle the environmental topics that are part of your curriculum?

ENVIRONMENTAL TOPICS	FREQUENCY YES
Earth Day	31
Ecology of Plants & Animals	26
Energy Conservation	26
Environmental Law	6
Natural Resources	23
Pollution of Air, Water, etc.	34
Recycling	35
Rock Cycle	26
Soil Formation	19
Water Cycle	31
Weather	21
Weathering & Erosion	29
Other:	6

Table XVIII shows that all environmental topics given in the survey are taught by some of the teachers at some time. Recycling is taught most frequently by 35 teachers (72.91%) followed by pollution of the air, water and etc. with a frequency of 34 teachers (70.83%). The water cycle and Earth Day topics are covered by 31 teachers (64.58%). The environmental law is taught by the fewest teachers (six or 12.50%).

TABLE XIX

FREQUENCIES OF STUDENTS TIME SPENT ON VARIOUS OUTDOOR ACTIVITIES BY TPS MIDDLE SCHOOL SCIENCE TEACHERS

20. How much class time is spent by **STUDENTS** doing each of the following:	Never	Less than once a month	Once a month	Once a week	Almost daily
• Using an outdoor site for environmental instruction?	1	19	22	5	1
• Using Hands-on activities: i.e.: use of manipulatives, experimenting, using lab materials, etc., in an outdoor setting?	14	18	5	6	3
• Using a textbook in an outdoor setting: i.e. reading assignments	32	12	3	1	-
• Doing paper & pencil work in an outdoor setting: i.e.: answering questions, worksheets, defining vocabulary words, outlining chapters, etc.	33	12	3	-	-

Note: A dash indicates no response was reported.

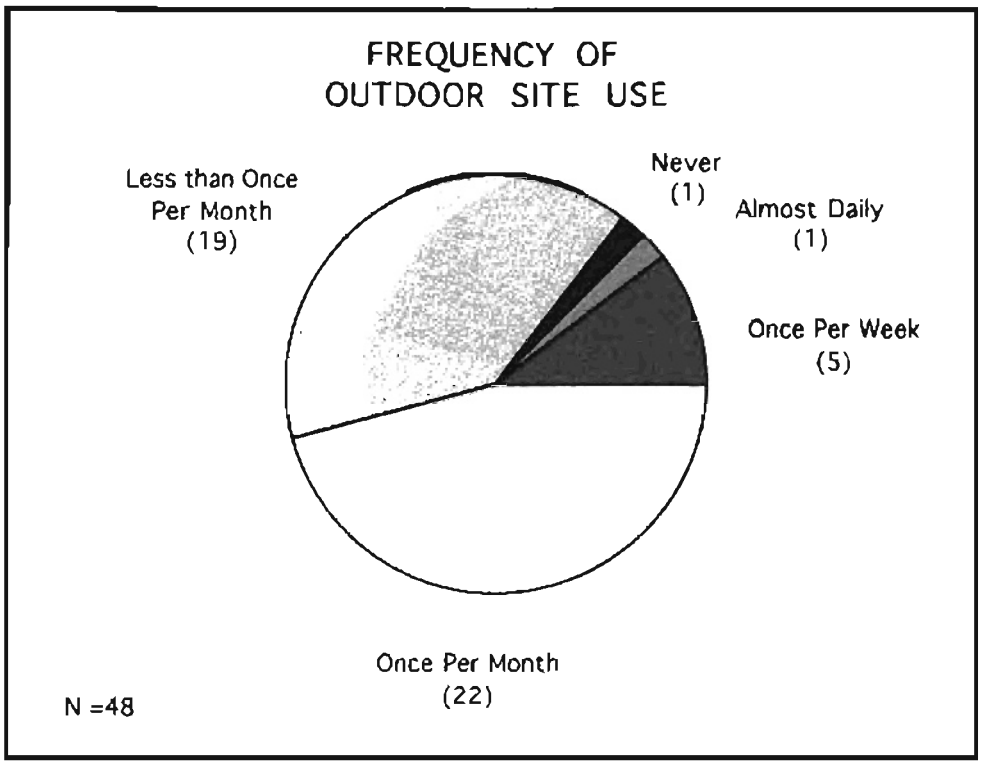


Figure 13. Frequencies of Use of an Outdoor Site by TPS Middle School Science Teachers

Using an Outdoor Site for Environmental Instruction

The data show that most of the teachers, 41, use their outdoor site once a month or less (85.41%). It is interesting to note that In Table XVI, 24 teachers reported not having an outdoor site available at all and as Table XIX shows only one teacher indicated never teaching in an outdoor site. What happened to the other 23 teachers who do not have an outdoor site?

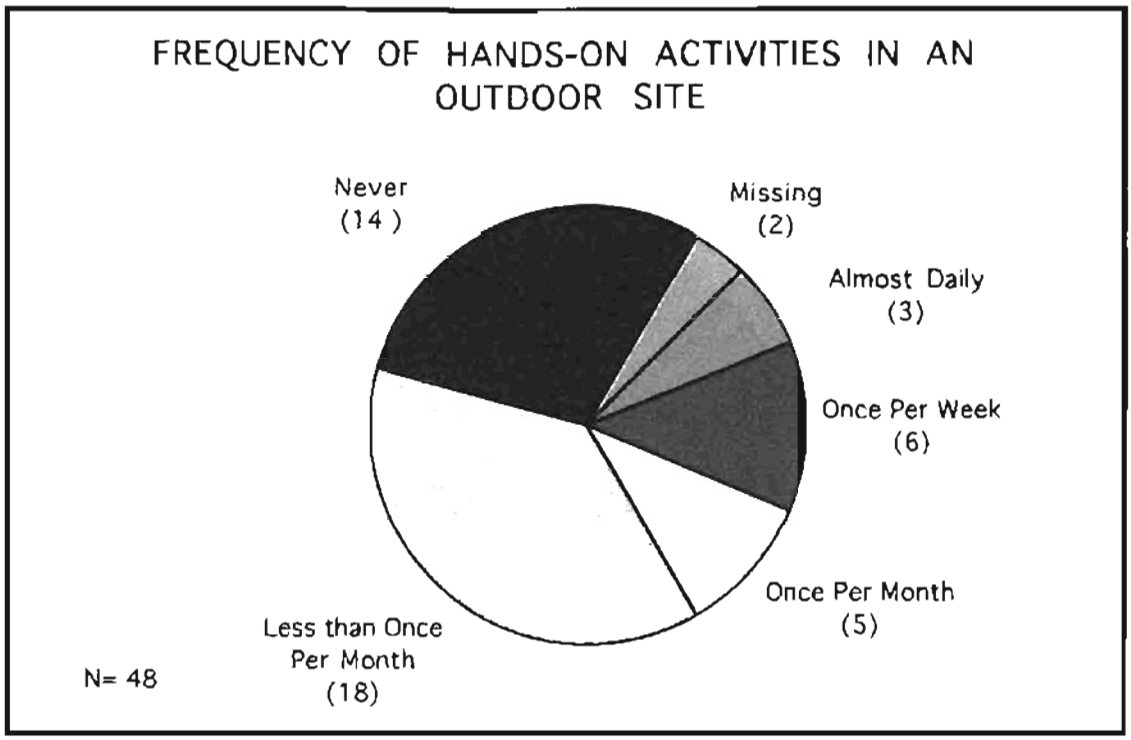


Figure 14. Frequencies of Hands-on Activities in an Outdoor Setting by TPS Middle School Science Teachers

Using Hands-on Activities In An Outdoor Setting

Most teachers (37.50%) use hands-on activities in an outdoor setting less than once per month. It is interesting to note that three teachers (6.25%) who reported using an outdoor site almost daily, also use the site for hands-on instruction almost daily.

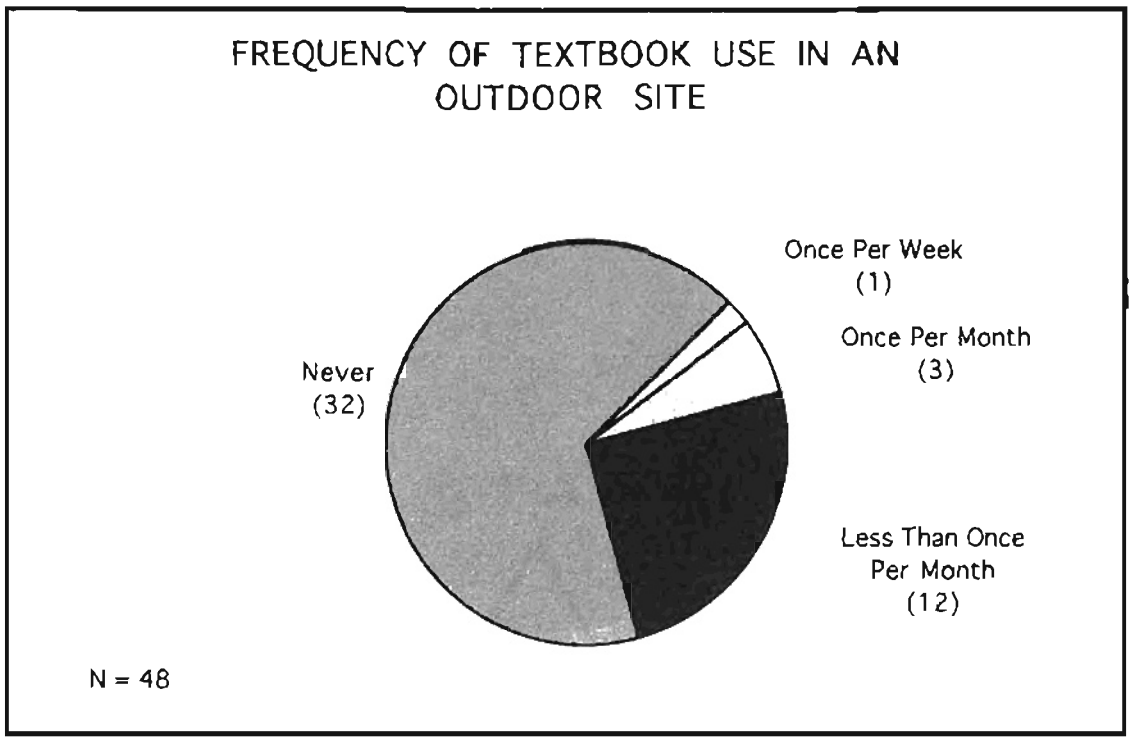


Figure 15. Frequencies of Textbook Use in an Outdoor Site by TPS Middle School Science Teachers

Using a Textbook in an Outdoor Setting

Most teachers indicated they never use textbooks outdoors. Of the twelve teachers (25%) who do use the text outside, the occurrence is less than once per month. Only three teachers (6.25%) use the book outside once per month.

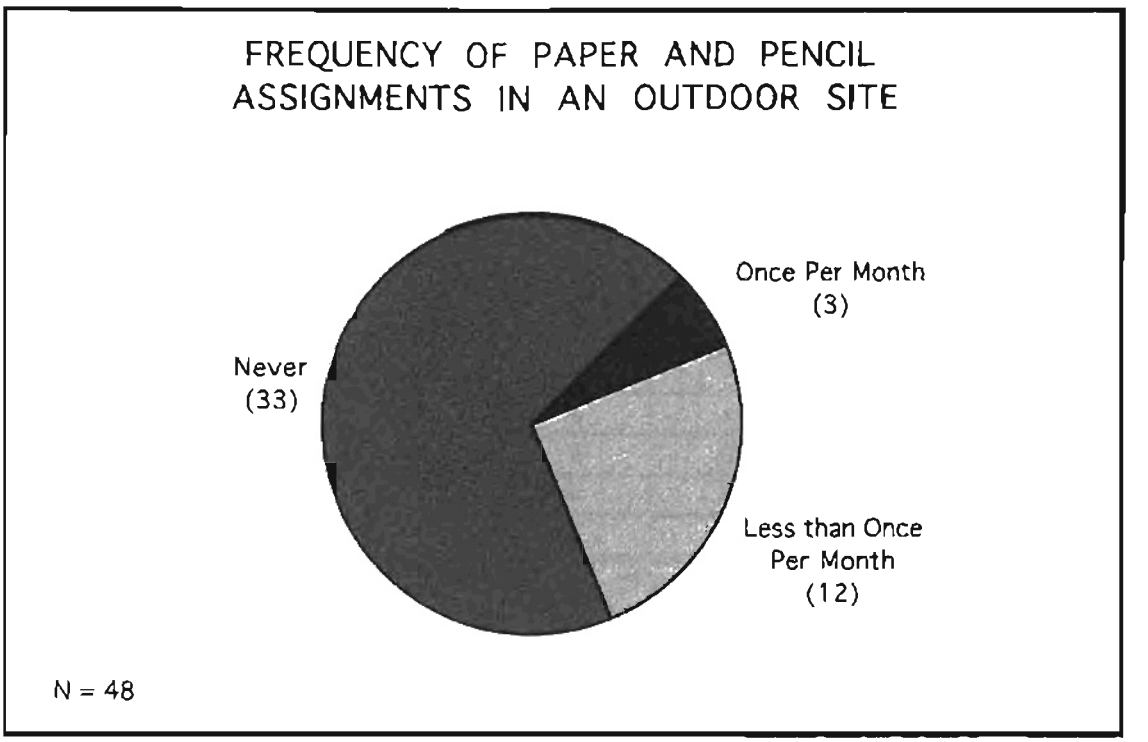


Figure 16. Frequencies of Paper and Pencil Assignments in an Outdoor Setting by TPS middle school science teachers.

Paper & Pencil Work in an Outdoor Setting

As Figure 16 illustrates similar results were reported on paper and pencil use. Most teachers (68.75%) do not use paper and pencil activities in an outdoor setting. Paper and pencil assignments are used less than once per month by 12 teachers (25%). Only three teachers (6.25%) do so once per month.

TPS Survey Question Comparisons

The next group of Tables XX through XXI show comparisons of two variables using the chi square test. Years of teaching are compared to the following variables: years of teaching science, discipline problems, desire for further science education, textbook and hands-on use.

TABLE XX

COMPARISON OF TEACHING EXPERIENCE TO YEARS OF TEACHING SCIENCE OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

	YEARS OF TEACHING SCIENCE				
YEARS OF TEACHING	5 or Less	6-10	11-15	16-20	Over 20
5 or Less	18	-	-	-	-
6-10	1	9	-	-	-
11-15	-	1	4	-	-
16-20	-	-	1	3	-
Over 20	1	1	1	-	8

Note: Chi Square =131.509339 df =16 $p < .00001$
Cells with expected frequency < 5 = 24 of 25 (96.0%).
A dash indicates no data reported.

Table XX compares the total number of years of teaching science to the total number of years of teaching experience. Due to the fact that less than five cells have the expected frequency the significance between groups is meaningless. The majority of teachers have been teaching only science classes for their total teaching career. The most noticeable change is in the over twenty year category, where three out of the eleven teachers have had their assignment changed to science. Only one teacher who has been teaching over 20 years has been teaching science for less than five years.

TABLE XXI

COMPARISONS OF YEARS OF TEACHING SCIENCE TO DISCIPLINE PROBLEMS OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

DISCIPLINE PROBLEMS

YEARS OF TEACHING SCIENCE	NEVER	LESS THAN ONCE PER MONTH	ONCE PER MONTH	ONCE PER WEEK	ALMOST DAILY
5 OR LESS	1	3	2	4	10
6-10	1	2	1	1	6
11-15	-	2	-	2	2
16-20	-	-	-	2	1
OVER 20	-	2	-	1	5

Note: Chi Square = 9.86980 df =16 p = 0.87334
Cells with expected frequency < 5 = 23 of 25 (92.0%)
A dash indicates no response reported.

Table XXI compares the frequency of discipline problems to the total years of teaching science. There is no significant difference between the two groups. Overall, 50% of the teachers reported having discipline problems on an almost daily basis. In the group of teachers who have taught science up to ten years, six out of eleven have discipline problems on an almost daily basis. In the veteran group, five teachers (62.5%) out of the eight teachers in this group reported that discipline problems occur on an almost daily basis. It is interesting to note the two teachers who never experience discipline problems have taught science ten years or less.

TABLE XXII

COMPARISONS BETWEEN TEACHING EXPERIENCE AND DISCIPLINE PROBLEMS OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

	DISCIPLINE				
YEARS OF TEACHING	NEVER	LESS THAN ONCE PER MONTH	ONCE PER MONTH	ONCE PER WEEK	ALMOST DAILY
5 OR LESS	1	3	1	4	9
6-10	1	2	2	1	4
11-15	-	1	-	2	2
16-20	-	-	-	2	2
OVER 20	-	3	-	1	7

Note: Chi Square =11.78464 df =16 p = 0.75867
Cells with expected frequency < 5 = 22 of 25 (88.0%)
A dash indicates no data reported.

Table XXII compares discipline problems to total years of teaching experience. There is no significant difference between the two groups. As stated before discipline problems occur almost daily with 24 teachers (50%). Even in the less experienced teaching group there are 50% who encounter discipline problems on an almost daily basis. In the veteran group of over 20 years of teaching experience, seven out of eleven teachers (63.63%) have discipline problems almost daily.

TABLE XXIII

COMPARISONS BETWEEN YEARS OF TEACHING SCIENCE TO TEACHERS DESIRE FOR SCIENCE EDUCATION

EDUCATION

TOTAL YEARS OF TEACHING SCIENCE	NEVER	LESS THAN ONCE PER MONTH	ONCE PER MONTH	ALMOST DAILY
5 OR LESS	7	9	2	1
6-10	7	3	1	-
11-15	1	4	-	-
16-20	3	-	-	-
OVER 20	3	5	-	-

Note: Chi Square =10.90888 df =12 p = .53674
Cells with expected frequency < 5 =16 of 20 (80.0%)
A dash indicates no response reported.

In Table XXIII a comparison is shown between the total years of teaching science to how often teachers believe their teaching is limited and are needing more background information in science. There is no significant difference between the two variables. The data show that most teachers responded that they believe they need more training "less than once per month" or "never." This is also the case in the beginning science teacher category. Only one teacher indicated needing training on an almost daily basis, two once per month and nine teachers (47.36) feel they need more training less than once a month and seven teachers (36.84%) believe they never need training.

TABLE XXIV

COMPARISONS OF YEARS OF TEACHING EXPERIENCE TO TEXTBOOK USE OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

	TEXTBOOK USE				
YEARS OF TEACHING EXPERIENCE	NEVER	LESS THAN ONCE PER MONTH	ONCE PER MONTH	ONCE PER WEEK	ALMOST DAILY
5 OR LESS	6	1	3	3	5
6-10	1	-	1	-	8
11-15	1	1	-	-	3
16-20	1	-	-	-	3
OVER 20	3	-	-	2	6

Note: Chi Square = 16.11127 df =16 p = 0.44522
Cells with expected frequency < 5 =22 of 25 (88.0%)
A dash indicates no response reported.

Table XXIV compares the total years of teaching to the use of the textbook. The column total indicates the frequencies for textbook use. There is no significant difference between textbook use and years of teaching. The data show that most teachers (52%) in every range of teaching experience use the textbook almost daily. Six teachers (33.33%) out of the 18 teachers in the least experienced group never use the textbook. Five teachers (27%) out of the 18 teachers in this group use the textbook almost daily. In the over 20 years of teaching experience group, three teachers (27.2%) never use the textbook and 54.5% in this group use the textbook almost daily.

TABLE XXV

COMPARISON OF YEARS OF TEACHING EXPERIENCE TO USE OF HANDS-ON ACTIVITIES OF MIDDLE SCHOOL SCIENCE TEACHERS

	HANDS-ON ACTIVITIES			
TOTAL YEARS OF TEACHING	LESS THAN ONCE PER MONTH	ONCE PER MONTH	ONCE PER WEEK	ALMOST DAILY
5 OR LESS	2	3	10	3
6-10	-	2	7	1
11-15	1	1	1	2
16-20	-	2	1	1
OVER 20	-	2	7	2

Note: Chi Square = 9.67751 df =12 p = 0.64423
Cells with expected frequency < 5 =17 of 20 (85.0%)
A dash indicates no response reported.

Table XXV compares the total years of teaching to the use of the hands-on teaching methods. There is no significant difference between the years of teaching experience and use of hands-on methods. Hands-on activities are practiced most often once per week by 26 teachers (54.2%). Within this time frame, ten of the 26 teachers have taught five years or less and seven teachers (26.92%) have taught 20 years or more.

Comparison of the 1977 NSF and 1996 TPS Survey Results

The following section compares the NSF survey of 1977 to the TPS survey of middle school science teachers. A comparison between teaching techniques will be discussed first, followed by teaching conditions and factors which restrict teaching.

TABLE XVI

DATA OF TEACHING TECHNIQUES FROM
1977 NSF SURVEY
GRADES 7-9

Techniques	Never	Less than once per month	Once per month	Once per week	Almost daily	Missing
NSF Lecture	5	6	9	48	30	2
NSF Discussion	1	2	4	34	56	3
Students use of hands-on manipulatives	5	16	17	37	24	2

Note: N = 535. Data are given in percentages. (Weiss, 1978, p. B-62).

TABLE XXVII

DATA OF TEACHING TECHNIQUES OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

TECHNIQUES	NEVER	LESS THAN ONCE PER MONTH	ONCE PER MONTH	ONCE PER WEEK	ALMOST DAILY	MISSING
Lecture & Discussion	-	-	6.25	33.33	60.41	-
Students use of hands-on manipulatives	5	16	17	37	24	2

Note: N = 48. A dash indicates no response reported. Data are shown in percentages.

Tables XXVI and XXVII show percentages of how often lecture, discussion and hands-on activities were utilized by the 1977 NSF and TPS teachers surveyed. Lectures were given most frequently on a once per week or more by 78 % of the NSF teachers and 93.74% of the TPS science teachers. Discussion is used once a week or more by 90% of the NSF teachers surveyed. Discussion was not a separate variable in the TPS survey. The use of hands-on manipulatives is most frequently used once per week or more by 61% of the NSF teachers and 72.91% by the TPS teachers. However 5% of the NSF teachers and none of the TPS teachers reported never using hands-on materials.

Comparison of 1977 NSF and 1996 TPS Survey Questions

Questions held in common concerning teaching conditions and factors which restrict teaching from the 1977 NSF and TPS survey are listed in

Tables XXVIII and XXIX. The NSF survey reflects data from teachers of grade levels 7-9. The sample size from the NSF survey was 535 and 48 for the TPS survey.

TABLE XXVIII

FREQUENCIES OF FACTORS THAT RESTRICT TEACHING FROM THE 1977 NSF SURVEY

FACTORS	SERIOUS PROBLEM	SOMEWHAT OF A PROBLEM	NOT A SIGNIFICANT PROBLEM
Inadequate facilities	26	40	34
Insufficient funds for equipment & supplies	24	39	36
Insufficient numbers of textbooks	7	16	77
Teacher inadequately prepared to teach subject matter	3	23	74
Lack of teacher planning time	7	31	61
Not enough time to teach subject	4	31	65
Class Size too large	19	44	37
Difficulty in maintaining discipline	6	30	64

Note: N = 535 . Data are in percentages from teachers of grades 7-9. (Weiss, 1978, p. B-128).

TABLE XXIX

FREQUENCIES OF FACTORS THAT RESTRICT TEACHING OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

FACTORS	NEVER	LESS THAN ONCE PER MONTH	ONCE PER MONTH	ONCE PER WEEK	ALMOST DAILY
Insufficient funds for equipment & supplies	8.3	8.3	20.8	12.5	50
Insufficient numbers of textbooks	25	4.2	8.3	10.4	52.1
Teacher inadequately prepared to teach subject matter	43.8	43.8	6.3	-	2.1
Lack of teacher planning time	33.3	12.5	16.7	22.9	12.5
Not enough time to teach subject	18.8	20.8	18.8	27.1	12.5
Difficulty in maintaining discipline	4.2	18.8	6.3	20.8	50

Note: N = 48. Data are given in percentages. A dash indicates no response reported.

Inadequate Facilities

Most of the TPS teachers surveyed (64.58%) rated the adequacy of the science classroom as fair to poor. Classroom adequacy was rated somewhat of a problem with the NSF teachers (40%).

Due to the team concept, science teachers may be assigned to a classroom that is not designed to teach science. The reasoning behind these room changes is to promote the team concept which is to build unity among the students with their teachers. By locating the team of core teachers to the same area of the school, it is believed to promote rapport among the students and their teachers. However, the basics of running water, cabinets, storage, electrical outlets, etc. are often missing in the classrooms. Also the rooms are usually too small to adequately house tables rather than desks to facilitate

science teaching. As a result, the rooms are inadequately designed, have poor facilities and teaching suffers.

Insufficient Funds for Equipment and Supplies

Insufficient funds for equipment and supplies was reported to be a major problem for TPS and somewhat of a problem for NSF teachers (39%). As many as 62.5% of the TPS teachers encounter this problem once per week or more. Only four TPS teachers (8.33%) are never restricted by the schools' budget. One teacher surveyed indicated never having material and equipment needs. This is not because all the material and equipment needs are provided, but as the teacher commented: "No, I buy my own." This attitude of supplying the school with personal funds may be a solution for this one particular teacher but it reinforces the difficulties of budget restraints. As stated by Dr. E. Kelble at an NSF-funded workshop, "Teachers should never spend their own money for student use. When a teacher buys her own classroom equipment she undercuts all other teachers because it causes administrators to expect all teachers to buy their own. In the long run, she makes the problem of budget worse for all teachers" (Dr. E. Kelble, personal communication, June 11, 1995).

In the 1980's each middle school changed to site-based management. Site-based management means the school is allocated a budget for supplies, substitute teachers, textbooks, etc. and the school decides how much money to spend in each area. There is no longer a guaranteed budget set aside for the science department. As a result, teachers often rely on fund-raisers to supplement funds.

Insufficient Numbers of Textbooks

The lack of textbooks was indicated as a problem for TPS teachers. On the other hand, as many as 77% of the NSF teachers surveyed reported textbooks not to be a significant problem. TPS teachers (62.5%) have this problem on a once a week to almost daily basis. On the opposing end, 25% of the TPS teachers never have a textbook allotment shortage or if they do it is less than once per week or as infrequent as less than once per month. In the 1980's every student in all of TPS middle school science classes was issued a science textbook. Today this is not the case; usually there are only enough funds available to purchase a class set of 30 science textbooks. As a result, the books cannot be checked out and students cannot be accommodated.

Teacher Inadequately Prepared to Teach Subject Matter

The question of whether teachers are adequately prepared to teach subject matter was not a major concern for either group. The NSF survey reported 74% of the teachers indicated this is not a significant problem. As many as 87.6 % of the TPS teachers, encounter this difficulty less than once a month or not at all. Only one teacher indicated a perception of being deficient in training on a daily basis. This teacher commented on the survey that she was given a two-week notice that she would be teaching science in grades six through eight despite the fact she has never taught science in her 27 years of teaching. There is no wonder this teacher felt a need for more science training.

Lack of Teacher Planning Time

Lack of teacher planning time was not a significant problem for 61% of the NSF teachers surveyed. For some TPS teachers the amount of planning period time can be an issue. Of the TPS teachers survey 35.4% felt they need more planning time on an almost daily or once per week basis. Another 29.2% reported this problem occurs only once a month or less than once per month. As many as 33.3% of the TPS teachers indicated never having an inadequate amount of planning time.

The daily schedule for most TPS middle schools includes two 45 minute planning periods. This may sound like an adequate amount of time but often the time is spent in activities that have no direct impact on teaching such as team meetings, parent conferences, and covering another teacher's class due to the lack of a substitute.

Not Enough Time to Teach Subject

Having adequate class time to teach was not a significant problem for 65% of the NSF teachers surveyed and 58.3% of the TPS. The daily schedule for most TPS middle schools allows 45 minute class periods. Some schools have incorporated team scheduling. For example a 90 minute block of time may be divided into any length the team of teachers decides upon. Block scheduling allows for longer or shorter class periods as needed by teachers.

Large Class Size

The size of the class is somewhat of a problem for NSF and a problem for TPS teachers. Class size is a concern once per week or more often by 58.35% of the TPS teachers surveyed and by 44% for the NSF teachers surveyed.

Most of the TPS middle school science teachers reported their average class size as being 28 students. However, some teachers have as many as 30 or more students in a class. House Bill 1017 states that each middle school teacher can have a total enrollment of 140 students. There is no limit set on the number of students enrolled per class. Therefore, a teacher may have only 17 students enrolled in one class and 36 in another class. As long as the limit of 140 students has not been exceeded this practice is legal.

Having large classes may contribute to other factors which limit teaching. Discipline problems rise with more students in class. The larger the class the greater the potential for students to horseplay and be disruptive. The issue of insufficient numbers of textbooks, and not enough equipment and material to perform laboratories is compounded with a larger class size. Instead of two students sharing equipment, now three to four must share the same equipment Also providing individual assistance to students is more difficult if not impossible with large classes. One-on-one help which is needed especially by inclusion students becomes rare. The teacher cannot reasonably assist all the students in need. Safety concerns pose potential problems as well with more students in a classroom. The possibility of unsafe conditions increases with 36 students as compared to a class size of 24 students.

Difficulty in Maintaining Discipline

Difficulty maintaining discipline was reported not to be a significant problem for NSF teachers by 64%. However, discipline was definitely identified as a serious problem for the TPS teachers surveyed. As many as 70.83% of the TPS teachers reported discipline as a major issue on an almost daily or once per week basis.

Being consistent with discipline procedures and consequences is the key to a successful discipline plan. Middle school students often tests the limits of the teacher by being disrespectful and uncooperative. Teachers have many ways of dealing with unruly students but when these methods have proven unsuccessful support from the administration is appreciated. The issue of discipline would be alleviated with sufficient funds for improving classroom facilities, purchasing equipment, materials, and textbooks, and reducing class size.

Summary of 1977 NSF and 1996 TPS Surveys

The following list the areas in need of greatest improvement as reported by TPS teachers surveyed:

- Discipline problems (70.83%)
- Funding for equipment and supplies (62.5%)
- Textbook allocation (62.5%)
- Class size (58.3%).

TPS Teachers reported some improvements are needed in the following areas:

- Teacher adequately prepared to teach subject matter (87.6%)
- Length of class time (58.3%)
- Teacher planning time (35.4%).

The NSF teachers also reported inadequacies in these areas:

- Large Class size (44%)
- Classroom facilities (40%)
- Funds for equipment and supplies (39%).

There are three areas in which both NSF and TPS middle school teachers indicated improvements should be made. Funding for equipment and supplies, improvement of facilities and reduction in class sizes were reported as problem factors in both surveys.

Despite the 19 year time lapse between the surveys, both indicate similar results concerning science teaching techniques. The majority of TPS middle school science teachers and NSF science teachers used lecture and discussion as frequently as once per week or more often. Also most TPS and NSF science teachers employed hands-on methods once per week.

Summary of The Tulsa Public School Middle School Science Teacher Survey

The following is a summary of the Tulsa Public Middle School Science Teacher Questionnaire of 1996. The summary will cover each of the following sections of the questionnaire:

- Section A: Educational Background
- Section B: Teaching Information and Experience
- Section C: Teaching Conditions
- Section D: Environmental Education.

Section A: Educational Background

The majority of the science teachers surveyed have the following educational background:

- Masters degree or higher, (52.08%)
- 45 hours of college credit in science courses
- Minor degree or area of concentration in science (N=44, 79.54%).

Section B: Teaching Information and Experience

Most of the science teachers surveyed indicated having the following teaching information and experience:

- Certification or endorsement for grades 7-12 (60.41%)
- General Science certification or endorsement (95.83%)
- Average class size of 28 students
- Teach five classes per day (64.58%)
- Curriculum of general science (47.91%)
- Attend three or four science workshops per year (43.75%)
- Rate science classroom as fair to excellent (81.25%)
- Teaching experience of ten years or less (58.33%)

- Science teaching experience of ten years or less (64.58%).

Section C: Teaching Conditions

Factors that teachers indicated frequently limit or restrict their teaching on a once a week or almost daily basis are the following:

- Discipline (70.83%)
- Budget (62.5%)
- Textbook allocation (62.5%)
- Equipment and material needs (58.33%)
- Large class size (58.33%)
- Intercom interruptions (56.25).

Factors which teachers indicate limit or restrict their teaching as once a month or less than once a month are the following:

- Covering an absent teacher's class (60.41%)
- Liability (58.33%)
- Appropriate training (54.16%)
- Teacher burnout (45.83%)
- Inclusion students (39.58%)
- Length of class time (39.58%)
- District objectives (35.41%)
- Planning period time (35.41%)
- P.A.S.S. objectives (31.25%).

The factor which seldom or never limits or restricts teaching is support from the principal (60.41%).

Most of the science teachers surveyed indicated their students often (once a week or almost daily) spend time in science class on the following tasks:

- Paper and pencil assignments (91.66%)
- Textbooks (75%)
- Hands-on activities (72.91%).

Most of the science teachers surveyed indicated their students make use of the library as infrequently as once a month or less than once a month (79.16%).

Most teachers never use computers with students (60.41%).

The majority of class time is spent by the science teacher doing the following:

- Lecture and discussion (93.75%)
- Dealing with discipline problems (70.83%)
- Audiovisuals (60.41%)

Less time is spent by most science teachers using the following:

- Guest speakers (91.66%)
- Field trips (72.91%).

Section: D Environmental Education

Most of the middle school science teachers reported the following environmental education information:

- Fifty per cent of the teachers surveyed do not have an outdoor site for science class use.
- Hands-on teaching methods are seldom practiced outdoors (47.9%).
- Textbooks and paper and pencil assignments are never used in an outdoor setting by 66.7% and 68.8% respectively.

Summary

In general TPS middle school science teachers are highly educated with a minor degree or endorsement in science. They attend approximately three or four science workshops per year. The majority of middle school science teachers have teaching experience of ten years or less. Most of the teachers have an area of certification or endorsement in the general science field for grade levels 7-12. The typical middle school science teachers schedule consists of five science classes per day with an enrollment of approximately 28 students in each class.

Discipline is the major factor that limits or restricts teaching most frequently for most TPS middle school science teachers. This is followed by the lack of site monies for textbook allocation, equipment and material needs.

Tulsa Public School middle school science teachers utilize paper and pencil assignments and textbook work daily or once a week. Hands-on activities occur once a week by most middle school science teachers.

Half of the middle schools who responded have access to an outdoor site for science class. Hands-on activities are more frequently utilized in the outdoor site than are written assignments, lecture and textbook assignments.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter will first present a summary of the results of the data collected from the TPS survey. Secondly, a summary of comparisons will be made between The 1977 National Survey of Science, Mathematics, and Social Studies Education and the Tulsa Public Schools System Survey of Middle School Science Teachers. Next, conclusions regarding the research questions will be drawn and recommendations given. Lastly, future research questions will be discussed and suggested proposals.

Summary of TPS Survey

On the average, TPS middle school science teachers are highly educated with a minor degree or endorsement in science. They attend about three or four science workshops per year. Their teaching experience consists of ten years or less. Their area of certification or endorsement is in the general science field for grade levels 7-12. Their typical schedule consists of five science classes per day with an enrollment of approximately 28 students in each class.

Discipline was identified by more respondents as being a major factor that limits or restricts teaching for most TPS middle school science teachers. This is followed closely by the budget, textbook allocation, equipment and material needs and inadequacy of facilities.

Teachers utilize paper and pencil assignment and textbook work most often on a daily or once a week basis and hands-on activities occur as frequently as once a week.

Summary of The 1977 NSF and the 1996 TPS Surveys

There are three areas in which both NSF and TPS middle school teachers indicated improvements should be made. Funding for equipment and supplies, improve facilities and reduction in class sizes were reported as problem factors in both surveys.

TPS and NSF surveys indicate similar results concerning science teaching techniques. Both surveys reported TPS middle school science teachers and NSF science teachers use lecture and discussion as frequently as once per week or more often. Also most TPS and NSF science teachers use hands-on methods once per week.

Conclusions and Recommendations

The following section discusses conclusions and recommendations for each research question.

1. What is the extent to which hands-on teaching methods and traditional methods are currently being utilized?

Most of the science teachers surveyed indicated their students often spend time once a week or almost daily in the following classroom tasks:

Lecture and discussion, paper and pencil assignments, textbook assignments and hands-on activities.

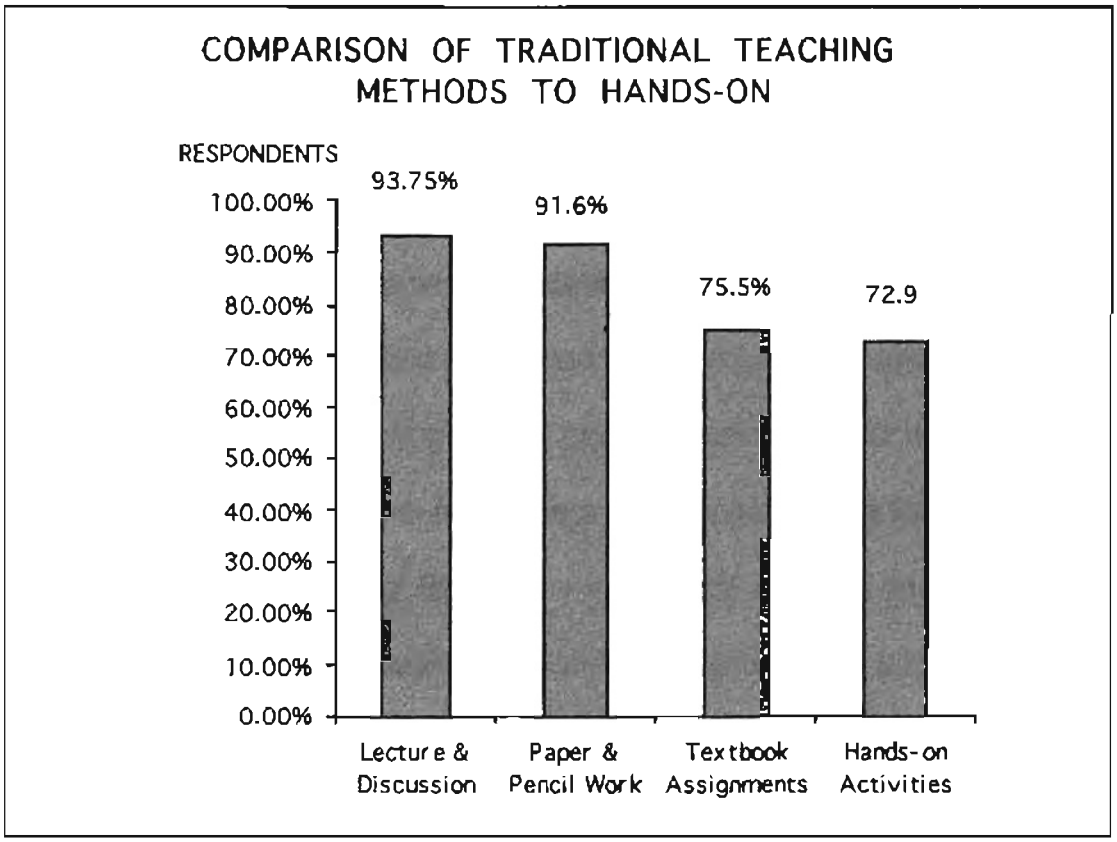


Figure 17. Comparison of traditional and hands-on teaching methods of TPS Middle School Science Teachers.

The survey found that traditional teaching methods, i.e. lecture and discussion, paper and pencil work and textbook assignments are used more often than hands-on methods. These findings are not surprising due to insufficient funding for supplies and materials, the high frequency of discipline problems, the inadequacy of science classrooms and large class sizes. Preparing for a hands-on lesson takes extra time, energy and above all equipment and materials. It is much less stressful to assign the class to read pages 25 through 40 and answer the questions at the end of the chapter than to

plan a hands-on lesson. Often school planning time is used in scrounging for equipment and materials or a trip to the Science Resource Center to check out equipment and then return it. The science resource center provides science kits and equipment and materials on loan to the schools for a short period of time. Other needed materials for the lesson are sometimes purchased by the teacher. Only one teacher surveyed indicated never having material and equipment needs. This is not because all the material and equipment needs are provided, but as the teacher commented: "No, I buy my own." As the survey data reported hands-on activities are being provided once a week or almost daily by 72.9% of the teachers surveyed. What percentage of the teachers would use hands-on methods if the roadblocks of insufficient funding for supplies and materials, discipline problems, inadequacy of science classrooms and large class sizes were removed?

Dealing with discipline is another major draw back in using hands-on methods. Problems with discipline were reported by 78.83% of the science teachers surveyed as frequently as once a week or more often. Some teachers are more comfortable in giving a textbook assignment than a hands-on assignment because they feel they have better control of the students. It is much less stressful for the teacher to give a textbook assignment than to deal the variety of discipline problems that may arise in conducting a hands-on lesson. Middle school students often test the limits of the teacher by being belligerent and uncooperative. Teachers have a variety of methods in dealing with unruly students but when these methods have proven unsuccessful,

administrative support is appreciated and necessary. Being consistent with discipline procedures and consequences is the key to a successful discipline plan in the school setting. Even the best behaved students will act out in response to the frustration of inconsistent discipline.

Discipline problems may also be compounded by students not finding the science curricula relevant and importance in to their daily lives. If students do not see a connection between the science topics and themselves, then apathy and disregard may replace their natural curiosity. Therefore, curricula assessments would be advantageous to teachers.

Textbook assignments were given by 75% of the teachers once a week or more. In the 1980's each student in middle school was able to have a science textbook issued to them. Today this is not the case. Usually there are only enough funds available to purchase a class set of 30 science textbooks. Students cannot check these books out and must either check out an older textbook or finish their assignments in class. This presents another problem of dealing with the vast ability ranges of the students. Some students can finish their assignments in class and others need more time. The problem of not being able to check a book out to finish the assignment is a major concern for slow learners and their parents. As an alternative some parents have requested the chapter be photocopied for their child. This brings up another problem concerning restrictions from copyright laws. Also the shortage of planning time as well as that of copier paper and the limitation placed on the use of the photocopy machine in some schools adds to the problem.

2. From among a prescribed list of factors which affect teaching conditions, which factors limit or restrict teaching most frequently?

Teachers reported seven factors which frequently limit or restrict teaching which are:

- Discipline (70.83%)
- Inadequate facilities (64.58%)
- Budget (62.5%)
- Textbook allocation (62.5%)
- Equipment and material needs (58.33%)
- Class size (58.33%)
- Intercom interruptions (56.25%).

TABLE XXX

FACTORS THAT RESTRICT TEACHING THE MOST FREQUENTLY BY TPS MIDDLE SCHOOL SCIENCE TEACHERS

LIMITING FACTORS	PERCENT OF RESPONDENTS
Discipline	70.83
Inadequate facilities	64.58
Budget	62.50
Textbook allocation	62.50
Equipment and material needs	58.33
Class size	58.33
Intercom interruptions	56.25

The lack of adequate funding is the crux of five of the seven problems which limit or restrict teaching. The factors of inadequate facilities, textbook allocation and equipment and material needs and even discipline can be

alleviated by improving the budget. Of the teachers surveyed 62.5% are limited or restricted by the lack of school funds. Without funding the door is closed to many activities and lessons proven to be most effective in teaching students. The expectation of providing all students with the best education without monies for supplies, materials, textbooks, facilities, etc. is ludicrous. One cannot expect a football team to improve without proper equipment, facilities, or coaching. The same situation occurs in TPS middle school science classrooms where teachers are expected to teach all students science without the basic tools! TPS middle school science teachers are to be commended for providing the type of science education they have with such towering obstacles in their path.

Discipline was indicated to be a major concern for 78.83% of the TPS science teachers surveyed. Being consistent with discipline procedures and consequences is the key to a successful discipline plan in the school. The issue of discipline could also be alleviated given sufficient funds for improving classroom facilities, purchasing equipment, materials, textbooks and lowering class size. Also assessing science curricula for student relevance will prove worthy of deferring discipline problems.

Textbook allocation and equipment and material needs were reported as being a problem once a week or more often. Both of these concerns are due to the budget. Each middle school switched to site-based management during the 1980's. Site-based management means the school is allocated a budget for supplies, substitute teachers, textbooks, etc. and the school decides how much money to spend in each area. There is no longer a set budget allocated for

science supplies and materials. As a result, the science department as well as other departments receive little funds and the money often is obtained through gifts and endowments.

Of the teachers surveyed 58.33% indicated class size restricts or limits teaching once a week or more often. The average class size is 28 students for 39.6 % of the teachers. Ideally teachers prefer to teach a small number of students.

Intercom interruptions are another factor that 56.25% of the teachers reported to frequently restrict or limit teaching. Regularly scheduled announcements are not the concern. What is a concern are all of the unscheduled announcements that disturb class. Once students are settled and on task any unusual occurrence may disrupt the entire learning environment.

Science classroom facilities were rated fair to poor by 64.58% of the teachers surveyed. Often science teachers are moved to rooms that are not designed for teaching science. These are classrooms which may not be equipped with the basics such as water, storage cabinets and a storage room or electrical outlets. The reasoning behind these moves is to group the team of core teachers to the same area of the building. This is to help build the team concept and provide unity among the students and their teachers. It appears the purpose of facilitating science teaching has been forfeited. A solution to the inadequate classroom is to remodel the classroom into an appropriate science room, but here again funding is a major factor.

The major issues discussed can all be solved or improved by finding the funds to alleviate the budget problem. The $94.5 million Tulsa Public School bond issue which passed in October of 1996 has allocated $25 million for the following:

- Textbooks
- Classroom Information Technology and Teacher Training
- District-Wide Networks
- School Networks
- Science Safety Equipment
- Phone System Upgrades and Replacements.

Fortunately the bond passed, but it may take up to two years for the effects of this much-needed bond money to impact the individual classroom.

3. Is there a relationship between the teaching method practiced and the number of years of teaching experience?

There is no significant difference between the teaching method practiced and the number of years of teaching experience.

The traditional teaching method of the textbook use was compared to years of teaching experience. There was no significant difference found between textbook use and years of teaching. The data show that most teachers (52%) in every range of teaching experience use the textbook almost daily. Six teachers (33.33%) out of the 18 teachers in the least experienced group (five years or less) never use the textbook. Five teachers (27%) out of the 18 teachers in this group use the textbook almost daily. In the over 20 years of teaching

experience group, 27.2% never use the textbook and 54.5% in this group use the textbook almost daily.

The use of hands-on methods were compared to years of teaching experience and again there was no significance found. Hands-on activities are practiced most often once per week by 26 teachers (54.2%). Within this time frame, ten of the 26 teachers have taught five years or less and seven teachers (26.92%) have taught 20 years or more.

There was no significant difference in the use of hands-on and traditional teaching methods by either the experienced or inexperienced teachers. Most of the teachers (54.16%) in all teaching experience levels use hands-on once per week. It was also found that over half of the teachers (52.08%) in every teaching experience category use the textbook almost daily.

4. How often is an outdoor site utilized for environmental teaching purposes?

Outdoor sites are available on a regular basis to 35.41% of the teachers and other teachers (14.58%) have some access. However 50% have no access to an outdoor site.

The utilization of outdoor sites occurs most often once a month or less by 85.41% of the teachers and only one teacher indicated never using an outdoor site. This information is contradictory since more teachers indicated using an outdoor site despite the report that one is not available. As many as 97.9% reported using an outdoor site at some time where only 50% reported having access to an outdoor site! Teachers surveyed may have drawn a distinction

between actually using an established outdoor classroom and taking their classes out-of-doors.

Hands-on activities were practiced more often than textbook or written assignments. However the occurrence of these activities was as infrequent as once a month or less. Therefore it is reasonable to assume that the most of the environmental topics are being instructed indoors. The reasons for this cannot be determined from this survey. One can only speculate what the drawbacks for teaching outdoors must be. The most obvious reason lies in potential discipline problems. The majority of teachers surveyed indicated having a high occurrence of discipline problems. If teachers are having so many problems controlling students in a classroom it is not hard to understand why they do not teach students outside very often. One may have all the knowledge to teach but this does not guarantee the students will learn. Teachers would undoubtedly benefit from having in-service workshops on managing students.

Summary

Overall teaching conditions have changed little since the NSF survey was administered in 1977. The major issues found in NSF's survey are similar to those that exist today. Discipline problems and textbook allocation, however, were not major issues in 1977 but are today. The three areas in which the NSF survey of 1977 and TPS survey of 1996 identified as in need of improvements are funding for equipment and supplies, improving facilities and reducing class sizes.

TPS and NSF surveys indicated similar results concerning science teaching techniques. The surveys reported TPS middle school science teachers and NSF science teachers use lecture and discussion as frequently as once a week, and occasionally more often. Also most TPS and NSF science teachers use hands-on methods once per week.

The NSF survey did not address environmental education, although for the last decade this has been the educational focus. Environmental crises such as deteriorating air and water quality, acid rain, toxic pollution from nuclear waste, lack of landfill space, the greenhouse effect, deforestation of the rain forest, and ozone depletion are evidence of an urgent need for our schools to focus on environmental curriculum. Fortunately more environmental educational materials are being produced each year for educators to take advantage of and include in their curricular plans. TPS middle school science teachers include environmental topics in their teaching but the majority do so in an Indoors setting. This is probably due to discipline problems teachers are confronted with daily. Nevertheless, it is time to educate the children in the importance of protecting natural resources and to invent new technologies for managing their legacy of pollution and to understand that the resilience of Earth's ecosystem is not infinite. Students need to get outside to experience the environment in person rather than through the eyes of a textbook. They need to be allowed to involve their senses in exploring the real Earth. The opportunity to dig in the soil and find an earthworm, plant sunflower seeds in a garden and observe the seasonal changes of a maple tree should be part of a child's day. By

incorporating outdoor sites in the Tulsa school system the teaching of environmental education will be enhanced with direct hands-on experience within a natural setting. Outdoor sites also provide a means of promoting environmental ethics. Therefore it is important to include outdoor sites as part of the school's facility.

Recommendations

Discipline and funding play a major role in the condition of our middle school science programs. The approval of the 94.5 million dollar TPS bond issue is promising but time will tell if this will truly impact the education of our students. This recent bond issue failed twice before passing. During the interim the students paid a large price of doing without, getting by and making do with very little. What will support the school system between bond issues? It appears the origin of the financial problems of the TPS district stems from the lack of community support. There needs to be a change of attitude and priorities. Too often nonpublic school families vote against public school issues. The TPS motto, "All children can learn" is not practical without community support.

Achieving smaller class size is a teachers dream. The National Education Association reported in their 1997 newspaper that smaller class sizes are being achieved in California's elementary schools and the push is to include middle and high schools in the near future. This class size decrease was achieved by a statewide campaign which resulted in a budget that appropriated nearly

$1 billion over three years for grade K-3 ("When size is a class matter," 1997). Will this modification move to Oklahoma? Hopefully TPS will follow the trend-setting state and be able to reduce class size. However, the budget, due to the lack of community support, has a great deal of control over class size reduction.

Another recommendation is for teachers to be able to teach only subjects in which they are prepared and which they desire to teach. As one teacher commented on the TPS survey her teaching assignment was changed to teach science after teaching math for 20 years. She was qualified to teach science because she had the required number of college hours in science courses. She had two weeks to prepare for the new assignment and was given no in-service training to help in the transition. Having the desire to teach a particular subject is just as important as having the required educational background. Having enough college credits to teach science when one does not have the desire nor believe they are well prepared to do so does not guarantee a content or worthwhile teacher.

The establishment of outdoor classrooms in all schools is another important consideration. The use of an outdoor site enhances environmental education by providing direct hands-on learning experience in nature as well as promoting an environmental ethic. Environmental ethics are primarily concerned with developing a more personal sense of stewardship by all members of society regarding the use of the environment. Becoming emotionally connected with nature promotes development of an environmental ethic (Riley, 1995). Where can such a happening occur but outdoors?

By including activities such as gardening students will understand their link to the environment. Humans are connected to the Earth and are not a guest. Their future survival and quality of life depends on their actions today. As Bert Horwood stated: "There is an urgent need for children to learn, to know, love, cherish and obey the natural world... Education, here, is more than knowing "about". It includes the intellectual aspects of learning (knowing), the emotional aspects of learning (loving), and the actions resulting from complete education (cherishing and obeying). Outdoor education is the only means by which people can recover their stone age identity; it is the only way by which people can discover that they are wild life, no different in the basics of life from wombats and gum trees. Indoor education can not possibly touch this central part of being human" (Horwood, 1990 p. 2). The addition of outdoor sites to all TPS campuses would allow teachers to incorporate direct experiences in environmental education and promote the environmental ethic.

As the survey reported very few science teachers utilize an outdoor site for environmental education. Teachers also indicated not needing more instruction in science areas. Could teachers possibly not recognize a need is indeed there for further environmental education? Teachers as well as students would undoubtedly benefit from additional environmental education in-service.

Improvements, Future Research Questions and Proposals

Initially this section first lists improvements applicable for this study. Secondly future research questions and proposals are discussed. To improve

this study on the evaluation of middle school science teaching methods in the Tulsa Public School system the following alternatives are recommended:

Question: How much time per week is spent in utilizing traditional and hands-on teaching methods when teaching a selected P.A.S.S. objective?

One benefit of this question would be to gather more concise findings about teaching methods being practiced in TPS middle school science classes. By using a smaller time range and limiting the type of lesson objectives being observed, more specific results could be acquired. In the 1996 TPS survey the time periods ranged from almost daily to less than once per month. These periods of time gave a generalized view of the teaching methods taking place in the classroom. By dividing the days of a week into frequency of use, the researcher will have a clearer picture of what methods are actually utilized in the classroom. By limiting the observed lesson to one of three P.A.S.S. objectives this will also give more specific results.

Also a larger selection of teaching techniques could be included in the survey. Possible teaching techniques may include: watching science video tapes, taking notes, answering questions, use of computers, library use, lab activities, writing a lab report, field trips, guest speakers, reading the textbook, answering questions, defining vocabulary words, listening to lectures, watching demonstrations, etc. By following this format, more concise results should occur.

Other research questions or proposals could include the following:

1. How often are teachers utilizing environmental materials from governmental departments, state and local agencies, i.e.: Department of Environmental Quality (DEQ), National Aeronautics and Space Administration (NASA), State Department of Education, the Metropolitan Environmental Trust (MET) and the county conservation office?

2. What factors account for the lack of outdoor site usage by middle school science teachers?

The TPS survey explored the problems facing science teachers, and why these problems exist. The next step is to determine ways of addressing these problems. As this study reported, half of the teachers surveyed do not have access to an outdoor site and those who do have access make occasional use of the site. A possible avenue of research would be to determine what reasons account for the infrequent use of an outdoor facility in middle school science classes. As discussed in the summary, discipline may play a crucial role in determining whether teaching takes place in an outdoors setting. What other factors influence the lack of teaching outdoors?

3. What impact on teaching methods would occur by placing special emphasis on environmental education as a separate and recognizable section of the P.A.S.S. objectives?

4. Is there a significant difference in the location of the instructional setting, i.e.: indoors versus outdoors? Compare test results of students who are taught environmental topics indoors to students who are taught the same topics outdoors.

5. What can be done to make environmental workshops more beneficial to science educators?

There are many in-service workshops on environmental topics offered to teachers. However as this study reported few teachers utilize the outdoor site. Many teachers have been shown to have a highly educated background with the majority of teachers attending three to four workshops a year. A possible research study would be to survey teachers attending environmental workshops such as Project WILD and Project WET. The participants could be asked how often this environmental material is used in science lessons. What are the major drawbacks of the workshops? Is the purpose for taking the workshop for gaining teaching ideas, knowledge, graduate credit or what?

Concluding Comment

After comparing the NSF survey of 1977 with the current practices and concerns of TPS middle school science teachers, it is interesting to find that there are no significant differences in the methods employed. Teachers currently are using hands-on with almost the same frequency as did teachers 19 years before. The most pressing factors causing teachers to tailor their methods to their particular classes have changed. Budget restraints and resulting inadequacies of facilities, equipment, and materials are a primary concern however, TPS teachers reported that discipline is the most frequent occurring teaching restriction in their classroom.

In addition to methodology choice and classroom concerns, it was also found that TPS teachers seldom use outdoor classrooms even when such a facility is available.

BIBLIOGRAPHY

Alexander, P., and Others. (1991). The outdoor classroom. Experiencing nature in the elementary curriculum. (Report No. SE052647). Indiana State Department of Education, Indianapolis. (ERIC Document Reproduction Service No. ED 338508)

Bredderman,T., (1982). Activity science-the evidence shows it matters. Science and Children, 20, 39-41.

Carin , A. C., Sund, R. B. (1970). Teaching science through discovery (2nd ed.). Columbus, Ohio: Merrill

Carpenter, R., (1963). A reading method and an activity method in elementary science instruction. Science Education. 47, 256-258.

DeBoer, G. E., (1991). A history of ideas in science education. New York: Teachers College Press.

Duschl, R. A., (1990). Restructuring science education, The importance of theories and their development. New York: Teachers College Press.

Georgia Forestry Commission, (1990). Georgia schoolyard wildlife habitat planning guide. p. 1.

Harlen, W., (1985). Teaching and learning primary science. London: Harper and Row Ltd.

Horwood, B., (1990). Why disturb the world outside? (Report No. RC019354). Ontario, Canada. (ERIC Document Reproduction Service No. ED 362375)

Kelble, Eileen., Personal communication, June 11, 1995.

Kline, Donna. (1996). Personal Communication, August 17, 1996.

Mechling, K. R., Oliver, D. L. (1983). Activities, not textbooks: what research says about science programs. Principal, 62 (4), 41-43.

National Research Council. (1996). National science education standards. Washington, DC: National Academy Press, p. 19-21, 23.

Oklahoma State Department of Education. (1994). A core curriculum for our children's future. Priority academic student skills. Oklahoma Department of Vocational and Technical Education, School improvement division. State Department of Education. Oklahoma's core curriculum pursuant to 70.O.S. § 11-103.6.

Oklahoma State Department of Education. (1975). Environmental education instructional activities booklet. Allied Printers and publishers, Inc., p. 3.

Peterson, R. T., (1991). Bridging early childhood and nature education (Report No. RC018077). Jamestown, New York: Roger Tory Peterson Institute of Natural History, Inc. (ERIC Document Reproduction Service No. ED 330527)

Renner, J. W., Stafford, D. G., Coffia, W. J., Kellogg, D. H., Weber, M. C., (1972). An evaluation of the science curriculum improvement study. School Science and Mathematics, 73, 291-318.

Riley, C. K., (1995). Capturing a sense of place. Pathways to outdoor communication, 5, 4-5. (Citation No. RC511011). (ERIC Document Reproduction Service No. EJ515271)

Roller, John., (1996). Personal communication, June, 1996.

Shymansky, J. A., Kyle, W. C., Jr., Alport, J. M., (1982). How effective were the *hands-on science programs of yesterday?* Science and Children, 20, 414-15.

Sivertsen, M. L., (1993). Transforming ideas fro teaching and learning science. State of the Art (No. 065-000-00599-9). US Department of Education: Author.

Smith, H. A., (1980). A report on three NSF studies: What are the needs in precollege science, mathematics, and social science education? Views from the field. National Science Foundation. (SE 80-9). Office of Program Integration. 44.

US Department of Agriculture, Soil Conservation Service, (1972). Outdoor classrooms on school sites. Washington, DC: US Government Printing Office.

Weiss, I. R., (1978). Report of the 1977 national survey of science, mathematics, and social studies education. (No. 038-000-00364-0). Washington, DC: US Government Printing Office.

Welch,W. W., Klopfer, L. E., Glen, S. A., Robinson, J. T., (1981). The Role of inquiry in science education: Analysis and recommendations. Science Education, 65 (1), 33-50.

When size is a class matter. (1997, January). NEA Today, p. 9.

Yager, R., Stodghill, R., (1979). School science in an age of science. What are the needs in precollege science, mathematics, and social science education? Views from the field. National Science Foundation. (SE 80-9). Office of Program Integration. 43.

APPENDIX A

The following is the TPS middle school science teachers questionnaire.

Middle School Science Teacher Questionnaire

Dear Colleague,

I am currently working on my masters degree thesis at Oklahoma State University on middle school science teaching methods in Tulsa Public Schools. I would greatly appreciate your input in completing this survey. Complete confidentiality will be provided.

If you would like a copy of the results of the survey, fill in the information below.

Name _____

School _____

Please drop your survey in the school mail and return by Monday, April 29,1996.

Thank you for your cooperation.

Kathryn L. Ainsworth
Byrd Middle School
7502 E. 57th St.
School # 641-1646 Home # 744-4758

SECTION A: EDUCATIONAL BACKGROUND

Circle the appropriate response or fill in your response on the blank line.

1. What is the highest degree you hold?
   A. Bachelor's
   B. Bachelor's plus _____
   C. Masters
   D. Masters plus 30
   E. Masters plus 60
   F. Doctorate
   G. Doctorate plus

2. Approximately how many undergraduate or graduate college hours do you have in science courses?

   _____

3. What is your area of concentration or in what area do you hold a minor degree?

   _____

SECTION B: TEACHING INFORMATION AND EXPERIENCE

4. In what grade levels are you certified or have an endorsement to teach science?
   A. K-6 B. 7-12 C. K-6 + Endorsement
   D. 7-12 + Endorsement E. None

5. In what science subjects are you certified or have an endorsement to teach?
   A. General Science B. Life C. Earth D. Physical E. None

6. How many years have you been teaching?
   1. 5 or less 2. 6-10 3. 11-15 4. 16-20 5. over 20

7. How many years have you taught science curriculum in any grade level?
   1. 5 or less 2. 6 to 10 3. 11 to 15 4. 16 to 20 5. over 20

8. What grade or grades are you currently teaching? _____

9. What is the average size of your science classes? _____

10. How many science classes do you teach per day? _____

.....OVER.....

11. What areas of science curriculum do you teach?
    1. Earth 2. Life 3. Physical 4. General Science 5. Other _____

12. How many science workshops do you attend per year?
    1. none 2. one to two 3. three to four 4. five or more

13. How adequate is your classroom equipped for teaching science, i.e. storage, running water, size, etc.?
    1. Poor 2. Fair 3. Good 4. Excellent

SECTION C: TEACHING CONDITIONS

√ Check the appropriate response.					
14. How often do the following limit or restrain your teaching?	Never	Less than once a month	Once a month	Once a week	Almost daily
• Equipment & material needs					
• Appropriate training					
• Lack of support from principal					
• Student textbook allocation					
• Budget restraints					
• Length of class time					
• Class size					
• Inclusion students					
• Intercom interruptions					
• Inadequate planning period time					
• Coverage of teachers' classes due to lack of substitute teacher					
• Liability					
• Discipline problems					
• P.A.S.S. Objectives					
• District objectives					
• Suffering from teacher burnout					
• Other					

√ Check the appropriate response.					
15. How much class time is spent by **STUDENTS** doing each of the following:	Never	Less than once a month	Once a month	Once a week	Almost daily
• Textbook: i.e. reading assignments					
• Paper & pencil work: i.e.: answering questions, worksheets, defining vocabulary words, outlining chapters, etc.					
• Hands-on activities: i.e.: use of manipulatives, experimenting, using lab materials, etc.					
• Use of computers					
• Use of library: i.e.: research, reports, etc.					
• Other:					

16. How much of the time is spent by you the **TEACHER**, doing each of the following?	Never	Less than once a month	Once a month	Once a week	Almost daily
• Lecturing and discussing					
• Use of guest speakers					
• Field trips					
• Use of audiovisual materials: i.e.: videos, laser disc, films, slides, etc.					
• Discipline problems					
• Other:					

SECTION D: ENVIRONMENTAL EDUCATION

17. Is an outdoor site available for teaching science?
    a. Yes b. No c. Sometimes

18. Does the school cooperate in providing an outdoor site for science use only?
    a. Yes b. No c. Sometimes

19. **Circle** the environmental topics that are part of your curriculum?

- Earth Day
- Ecology of Plants & Animals
- Energy Conservation
- Environmental Law
- Natural Resources
- Pollution of Air, Water, etc.
- Recycling
- Rock Cycle
- Soil Formation
- Water Cycle
- Weather
- Weathering & Erosion
- Other: _____

√ Check the appropriate response.					
20. How much class time is spent by **STUDENTS** doing each of the following:	Never	Less than once a month	Once a month	Once a week	Almost daily
• Using an outdoor site for environmental instruction					
• Using hands-on activities: i.e.: use of manipulatives, experimenting, using lab materials, etc., in an outdoor setting					
• Using a textbook in an outdoor setting: i.e.: reading assignments					
• Doing paper & pencil work in an outdoor setting: i.e.: answering questions, worksheets, defining vocabulary words, outlining chapters, etc.					

THANK YOU FOR YOUR COOPERATION. PLEASE RETURN IN THE SCHOOL MAIL BY MONDAY, APRIL 29, 1996.

MAILING COVER PAGE IS ON THE BACK OF THIS PAGE. (FOLD & STAPLE)

----------*FOLD*----------

From: School Name: _____

To: Byrd Middle School
Kathryn L. Ainsworth

----------*FOLD*----------

The following is the reminder letter.

Dear Science Teacher,

You know you've been working too hard, so sit down, put your feet up and enjoy this gum, while you do something for me, fill out the questionnaire I sent you.

Now don't you feel better.
Drop it in the school mail A.S.A.P. or by Monday, April 29, and I'll stay off your back.

Thanks for your input and cooperation.

Nervous Kathy Ainsworth

P.S..If your desk looks like mine and you can't find your questionnaire call me at Byrd at 641-1646 or at home at 744-4758.

From: Kathryn L. Ainsworth
Byrd Middle School

APPENDIX C

The following are the data collected from TPS Middle School Science Teachers Survey of 1996.

SECTION A: EDUCATIONAL BACKGROUND

Circle the appropriate response or fill in your response on the blank line.

1. What is the highest degree you hold?

   A. Bachelor's
   B. Bachelor's plus _____
   C. Masters
   D. Masters plus 30
   E. Masters plus 60
   F. Doctorate
   G. Doctorate plus

TABLE C1
FREQUENCIES OF HIGHEST DEGREE OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

DEGREE	FREQUENCY	PERCENT	CUM PERCENT
Doctorate +	2	4.2	4.2
Doctorate	1	2.1	6.3
Masters +60	10	20.8	27.1
Masters +30	5	10.4	37.5
Masters	7	14.6	52.1
Bachelors +	12	25.0	77.1
Bachelors	10	20.8	97.9
Missing	1	2.1	100.0

2. Approximately how many undergraduate or graduate college hours do you have in science courses?

TABLE C2
FREQUENCIES OF COLLEGE HOURS OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

HOURS	FREQUENCY	PERCENT
100+	3	6.3
99	2	4.2
90	2	4.2
84	1	2.1
80	4	8.3
72	1	2.1
70	2	4.2
60	1	2.1
55	1	2.1
50	1	2.1
45	1	2.1
40	4	8.3
36	3	6.3
33	1	2.1
30	3	6.3
28	1	2.1
25	1	2.1
24	3	6.3
23	2	4 .2
18	3	6.3
16	1	2.1
14	1	2.1
0	6	12.5

3. What is your area of concentration or in what area do you hold a minor degree?

TABLE C3
FREQUENCIES OF AREAS OF MINOR DEGREES OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

AREA OF CONCENTRATION	FREQUENCY	PERCENT
Non-Science & Science	2	4.2
Non-Science	7	14.6
Science	35	72.9
Missing	4	8.3

Note: N = 44.

SECTION B: TEACHING INFORMATION AND EXPERIENCE

4. In what grade levels are you certified or have an endorsement to teach science?

A. K-6 B. 7-12 C. K-6 + Endorsement
D. 7-12 + Endorsement E. None

TABLE C4
FREQUENCIES OF GRADE LEVEL CERTIFICATION OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

LEVEL OF CERTIFICATION OR ENDORSEMENT	FREQUENCY	PERCENT
Combination of K-12	6	12.5
7-12	29	60.4
K-6	12	25.0
Missing	1	2.1

Note: Levels of certification are regrouped.

TABLE C5
FREQUENCIES OF GRADE LEVEL CERTIFICATION OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

GRADE LEVEL OF CERTIFICATION OR ENDORSEMENT	FREQUENCY	PERCENT
Grades K-6	4	.08
Grades 7-12	25	52.08
K-6 + Endorsement	8	16.66
Grades 7-12+ Endorsement	10	20.83
None	-	-
Missing	1	.02

Note: A dash indicates no response was reported.

5. In what science subjects are you certified or have an endorsement to teach?
   A. General Science B. Life C. Earth D. Physical E. None

TABLE C 6
FREQUENCIES OF SUBJECT OR AREA OF ENDORSEMENT OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

SUBJECT AREA OR ENDORSEMENT	FREQUENCY	PERCENT
General Science Areas	46	95.8
Physical Sciences	1	2.1
Life Sciences	1	2.1
Earth Sciences	-	-

Note: A dash indicates no response was reported.

6. How many years have you been teaching?
   1. 5 or less 2. 6-10 3. 11-15 4. 16-20 5. over 20

TABLE C7
FREQUENCIES OF YEARS OF TEACHING EXPERIENCE
OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

YEARS OF TEACHING EXPERIENCE	FREQUENCY	PERCENT
Over 20 Years	11	22.9
16-20 Years	4	8.3
11-15 Years	5	10.4
6-10 Years	10	20.8
5 or Less Years	18	37.5

7. How many years have you taught science curriculum in any grade level?
   1. 5 or less 2. 6 to 10 3. 11 to 15 4. 16 to 20 5. over 20

TABLE C8
FREQUENCIES OF YEARS OF TEACHING EXPERIENCE IN SCIENCE OF
TPS MIDDLE SCHOOL SCIENCE TEACHERS

YEARS OF TEACHING SCIENCE	FREQUENCY	PERCENT
Over 20 Years	8	16.7
16-20 Years	3	6.3
11-15 Years	6	12.5
6-10 Years	11	22.9
5 or Less Years	20	41.7

8. What grade or grades are you currently teaching? _____

TABLE C9
FREQUENCIES OF GRADE LEVELS TAUGHT BY TPS MIDDLE SCHOOL
SCIENCE TEACHERS

GRADE LEVEL	FREQUENCY	PERCENT
Sixth, Seventh & Eighth	6	12.5
Seventh & Eighth	5	10.4
Sixth and Seventh	3	6.3
Eighth	12	25.0
Seventh	9	18.8
Sixth	13	27.1

9. What is the average size of your science classes? _____

TABLE C10
FREQUENCIES OF AVERAGE NUMBER OF STUDENTS PER CLASS
OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

AVERAGE NUMBER OF STUDENTS PER CLASS	FREQUENCY	PERCENT
35	1	2.1
34	1	2.1
32	1	2.1
21	1	2.1
30	8	16.7
28	19	39.6
27	2	4.2
26	4	8.3
25	4	8.3
24	1	2.1
23	1	2.1
22	2	4.2
21	1	2.1
20	2	4.2

10. How many science classes do you teach per day? _____

TABLE C11
FREQUENCIES OF SCIENCE CLASSES TAUGHT PER DAY OF
TPS MIDDLE SCHOOL SCIENCE TEACHERS

SCIENCE CLASS PER DAY	FREQUENCY	PERCENT
6	6	12.5
5	31	64.6
4	9	18.8
3	2	4.2

11. What areas of science curriculum do you teach?
    1. Earth 2. Life 3. Physical 4. General Science 5. Other _____

TABLE C12
FREQUENCIES OF SCIENCE CURRICULUM TAUGHT BY TPS MIDDLE SCHOOL SCIENCE TEACHERS

SCIENCE CURRICULUM TAUGHT	FREQUENCY	PERCENT
Multiple Areas	17	35.4
General	23	47.39
Physical	3	5.3
Life	3	6.3
Earth	2	4.2

12. How many science workshops do you attend per year?
    1. none 2. one to two 3. three to four 4. five or more

TABLE C13
FREQUENCIES OF WORKSHOP ATTENDANCE PER YEAR OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

NUMBER OF WORKSHOPS ATTENDED PER YEAR	FREQUENCY	PERCENT
Five or More	11	22.9
Three or Four	21	43.8
One or Two	14	29.2
None	2	4.2

13. How adequate is your classroom equipped for teaching science, i.e. storage, running water, size, etc.?

    1. Poor 2. Fair 3. Good 4. Excellent

TABLE C14
FREQUENCIES OF SCIENCE CLASSROOM ADEQUACY OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

ADEQUACY OF SCIENCE CLASSROOM	FREQUENCY	PERCENT
Excellent	8	16.7
Good	8	16.7
Fair	23	47.9
Poor	8	16.7
Missing	1	2.1

SECTION C: TEACHING CONDITIONS

14. How often do the following limit or restrain your teaching?

TABLE C15
FREQUENCIES OF LIMITATIONS FROM EQUIPMENT AND MATERIAL NEEDS OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

EQUIPMENT AND MATERIAL NEEDS	FREQUENCY	PERCENT
Almost Daily	16	33.3
Once Per Week	12	25.0
Once Per Month	13	27.1
Less than Once Per Month	3	6.3
Never	3	6.3
Missing	1	2.1

TABLE C16
FREQUENCIES OF LIMITATIONS FROM FEELING DEFICIENT IN SCIENCE TRAINING OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

FEELING OF DEFICIENT SCIENCE TRAINING	FREQUENCY	PERCENT
Almost Daily	1	2.1
Once per Week	0	0
Once per Month	3	6.3
Less than Once Per Month	21	43.8
Never	21	43.8
Missing	2	4.2

TABLE C17
FREQUENCIES OF LACK OF SUPPORT FROM PRINCIPAL OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

Lack of Support from Principal	FREQUENCY	PERCENT
Almost Daily	4	8.3
Once Per Week	2	4.2
Once Per Month	2	4.2
Less than Once Per Month	9	18.8
Never	29	60.4
Missing	2	4.2

TABLE C198
FREQUENCIES OF TEXTBOOK ALLOCATION RESTRAINTS OF TPS MIDDLE SCIENCE TEACHERS

TEXTBOOK ALLOCATION	FREQUENCY	PERCENT
Almost Daily	25	52.1
Once Per Week	5	10.4
Once Per Month	4	8.3
Less Than Once Per Month	2	4.2
Never	12	25.0

TABLE C19
FREQUENCIES OF BUDGET RESTRAINTS OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

BUDGET RESTRAINTS	FREQUENCY	PERCENT
Almost Daily	24	50.0
Once Per Week	6	12.5
Once Per Month	10	20.8
Less than Once Per Month	4	8.3
Never	4	8.3
Missing	0	0

TABLE C20

FREQUENCIES OF LENGTH OF CLASS TIME RESTRAINTS OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

LENGTH OF CLASS TIME	FREQUENCY	PERCENT
Almost Daily	6	12.5
Once Per Week	13	27.1
Once Per Month	9	18.8
Less than Once Per Month	10	20.8
Never	9	18.8
Missing	1	2.1

TABLE C21

FREQUENCIES OF CLASS SIZE LIMITATIONS OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

CLASS SIZE	FREQUENCY	PERCENT
Almost Daily	19	39.6
Once Per Week	9	18.8
Once Per Month	6	12.5
Less than Once Per Month	10	20.8
Never	4	8.3
Missing	0	0

TABLE C22

FREQUENCIES OF LIMITATIONS FROM INCLUSION STUDENTS OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

INCLUSION STUDENTS	FREQUENCY	PERCENT
Almost Daily	14	29.2
Once Per Week	5	10.4
Once Per Month	5	10.4
Less than Once Per Month	5	10.4
Never	19	39.5
Missing	1	2.1

TABLE C23
FREQUENCIES OF LIMITATIONS FROM INTERCOM INTERRUPTIONS OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

INTERCOM INTERRUPTIONS	FREQUENCY	PERCENT
Almost Daily	10	20.8
Once Per Week	17	35.4
Once Per Month	2	4.2
Less than Once Per Month	11	22.9
Never	8	16.7
Missing	0	0

TABLE C24
FREQUENCIES OF LIMITATIONS FROM INADEQUATE PLANNING PERIOD TIME OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

INADEQUATE PLANNING PERIOD	FREQUENCY	PERCENT
Almost Daily	6	12.5
Once Per Week	11	22.9
Once Per Month	8	16.7
Less than Once Per Month	6	12.5
Never	16	33.3
Missing	1	2.1

TABLE C25
FREQUENCIES OF LIMITATIONS FROM COVERING CLASSES OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

COVERING CLASSES	FREQUENCY	PERCENT
Almost Daily	3	6.3
Once Per Week	13	27.1
Once Per Month	25	52.1
Less than Once Per Month	4	8.3
Never	2	4.2
Missing	1	2.1

TABLE C26
FREQUENCIES OF LIMITATIONS FROM LIABILITY OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

LIABILITY	FREQUENCY	PERCENT
Almost Daily	6	12.5
Once Per Week	3	6.3
Once Per Month	12	25.0
Less than Once Per Month	16	33.3
Never	8	16.7
Missing	3	6.3

TABLE C27
FREQUENCIES OF LIMITATIONS FROM DISCIPLINE PROBLEMS OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

DISCIPLINE	FREQUENCY	PERCENT
Almost Daily	24	50.0
Once Per Week	10	20.8
Once Per Month	3	6.3
Less than Once Per Month	9	18.8
Never	2	4.2
Missing	0	0

TABLE C28
FREQUENCIES OF LIMITATIONS FROM P.A.S.S. OBJECTIVES OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

P.A.S.S. OBJECTIVES	FREQUENCY	PERCENT
Almost Daily	8	16.7
Once Per Week	6	12.5
Once Per Month	7	14.6
Less than Once Per Month	8	16.7
Never	16	33.3
Missing	3	6.3

TABLE C29
FREQUENCIES OF LIMITATIONS FROM DISTRICT OBJECTIVES OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

DISTRICT OBJECTIVES	FREQUENCY	PERCENT
Almost Daily	8	16.7
Once Per Week	9	18.8
Once Per Month	8	16.7
Less than Once Per Month	9	18.8
Never	11	22.9
Missing	3	6.3

TABLE C30
FREQUENCIES OF LIMITATIONS FROM BURNOUT OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

BURNOUT	FREQUENCY	PERCENT
Almost Daily	4	8.3
Once Per Week	3	6.3
Once Per Month	11	22.9
Less than Once Per Month	11	22.9
Never	18	37.9
Missing	1	2.1

TABLE C31
FREQUENCIES OF LIMITATIONS FROM OTHER FACTORS OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

OTHER	FREQUENCY	PERCENT
Almost Daily	2	4.2
Once Per Week	3	6.3
Once Per Month	1	2.1
Less than Once Per Month	2	4.2
Never	0	0
Missing	40	83.3

15. How much class time is spent by **STUDENTS** doing each of the following:

TABLE C32
FREQUENCIES OF TEXTBOOK USE OF TPS MIDDLE SCHOOL SCIENCE STUDENTS

TEXTBOOK	FREQUENCY	PERCENT
Almost Daily	9	18.8
Once Per Week	27	56.3
Once Per Month	3	6.3
Less than Once Per Month	2	4.2
Never	4	8.3
Missing	3	6.3

TABLE C33
FREQUENCIES OF PAPER AND PENCIL WORK OF TPS MIDDLE SCHOOL SCIENCE STUDENTS

PAPER WORK	FREQUENCY	PERCENT
Almost Daily	21	43.8
Once Per Week	23	47.9
Once Per Month	1	2.1
Less than Once Per Month	1	2.1
Never	2	4.2
Missing	0	0

TABLE C34
FREQUENCIES OF HANDS-ON TEACHING OF TPS MIDDLE SCHOOL SCIENCE STUDENTS

HANDS-ON	FREQUENCY	PERCENT
Almost Daily	9	18.8
Once Per Week	26	54.2
Once Per Month	10	20.8
Less than Once Per Month	3	6.3
Never	0	0
Missing	0	0

TABLE C35
FREQUENCIES OF COMPUTER USE OF TPS MIDDLE SCHOOL SCIENCE STUDENTS

COMPUTERS	FREQUENCY	PERCENT
Almost Daily	1	2.1
Once Per Week	1	2.1
Once Per Month	4	8.3
Less than Once Per Month	12	25.0
Never	29	60.4
Missing	1	2.1

TABLE C36
FREQUENCIES OF LIBRARY USE OF TPS MIDDLE SCHOOL SCIENCE STUDENTS

LIBRARY	FREQUENCY	PERCENT
Almost Daily	-	-
Once Per Week	2	4.2
Once Per Month	10	20.8
Less than Once Per Month	28	58.3
Never	8	16.7

TABLE C37
FREQUENCIES OF OTHER TASKS OF TPS MIDDLE SCHOOL SCIENCE STUDENTS

OTHER	FREQUENCY	PERCENT
Almost Daily	-	-
Once Per Week	4	8.3
Once Per Month	-	-
Less than Once Per Month	2	4.2
Never	-	-
Missing	42	87.5

16. How much of the time is spent by your the **TEACHER**, doing each of the following?

TABLE C38
FREQUENCIES OF LECTURE AND DISCUSSION BY TPS MIDDLE SCHOOL SCIENCE TEACHERS

LECTURE	FREQUENCY	PERCENT
Almost Daily	29	60.4
Once Per Week	16	33.3
Once Per Month	3	6.3
Less than Once Per Month	-	-
Never	-	-

TABLE C39
FREQUENCIES OF USE OF SPEAKERS BY TPS MIDDLE SCHOOL SCIENCE TEACHERS

GUEST SPEAKERS	FREQUENCY	PERCENT
Almost Daily	-	-
Once Per Week	-	-
Once Per Month	12	25.0
Less than Once Per Month	32	66.7
Never	4	8.3

TABLE C40
FREQUENCIES OF USE OF FIELD TRIPS BY TPS MIDDLE SCHOOL SCIENCE TEACHERS

FIELD TRIPS	FREQUENCY	PERCENT
Almost Daily	-	-
Once Per Week	-	-
Once Per Month	1	2.1
Less than Once Per Month	34	70.8
Never	13	27.1

TABLE C41
FREQUENCIES OF USE OF AUDIOVISUALS BY TPS MIDDLE SCHOOL SCIENCE TEACHERS

AUDIOVISUALS	FREQUENCY	PERCENT
Almost Daily	8	16.7
Once Per Week	21	43.8
Once Per Month	14	29.2
Less than Once Per Month	5	10.4
Never	-	-

TABLE C42
FREQUENCIES OF DISCIPLINE PROBLEMS BY TPS MIDDLE SCHOOL SCIENCE TEACHERS

DISCIPLINE	FREQUENCY	PERCENT
Almost Daily	25	52.1
Once Per Week	9	18.8
Once Per Month	3	6.3
Less than Once Per Month	8	16.7
Never	3	6.3

TABLE C43
FREQUENCIES OF OTHER TASKS OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

OTHER	FREQUENCY	PERCENT
Almost Daily	3	6.3
Once Per Week	-	-
Once Per Month	1	2.1
Less than Once Per Month	-	-
Never	-	-
Missing	44	91.7

TABLE C44
FREQUENCIES OF TEACHING LIMITATIONS OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

14. How often do the following limit or restrain your teaching?	Never	Less than once a month	Once a month	Once a week	Almost daily
• Equipment & material needs	3 6.3	3 6.3	13 27.1	12 25	16 33.3
• Appropriate training	21 43.8	21 43.8	3 6.3	-	1 2.1
• Lack of support from principal	29 60.4	9 18.8	2 4.2	2 4.2	4 8.3
• Student textbook allocation	12 25	2 4.2	4 8.3	5 10.4	25 52.1
• Budget restraints	4 8.3	4 8.3	10 20.8	6 12.5	24 50
• Length of class time	9 18.8	10 20.8	9 18.8	13 27.1	6 12.5
• Class size	4 8.3	10 20.8	6 12.5	9 18.8	19 39.6
• Inclusion students	19 39.5	5 10.4	5 10.4	5 10.4	14 29.2
• Intercom interruptions	8 16.7	11 22.9	2 4.2	17 35.4	10 20.8
• Inadequate planning period time	16 33.3	6 12.5	8 16.7	11 22.9	6 12.5
• Coverage of teachers' classes due to lack of substitute teacher	2 4.2	4 8.3	25 52.1	13 27.1	3 6.3
• Liability	8 16.7	16 33.3	12 25	3 6.3	6 12.5
• Discipline problems	2 4.2	9 18.8	3 6.3	10 20.8	24 50
• P.A.S.S. Objectives	16 33.3	8 16.7	7 14.6	6 12.5	8 16.7
• District objectives	11 22.9	9 18.8	8 16.7	9 18.8	8 16.7
• Suffering from teacher burnout	18 37.9	11 22.9	11 22.9	3 6.3	4 8.3
• Other	-	2 4.2	1 2.1	3 6.3	2 4.2

Note: A dash indicates no response was reported. Percents are listed below frequencies.

TABLE C45
FREQUENCIES OF TIME SPENT ON TASK BY TPS MIDDLE SCHOOL SCIENCE STUDENTS

15. How much class time is spent by **STUDENTS** doing each of the following:	Never	Less than once a month	Once a month	Once a week	Almost daily
• Textbook: I.e. reading assignments	4 8.3	2 4.2	3 6.3	27 56.3	9 18.8
• Paper & pencil work: i.e.: answering questions, worksheets, defining vocabulary words, outlining chapters, etc.	2 4.2	1 2.1	1 2.1	23 47.9	21 43.8
• Hands-on activities: I.e.: use of manipulatives, experimenting, using lab materials, etc.	-	3 6.3	10 20.8	26 54.2	9 18.8
• Use of computers	29 60.	12 25	4 8.3	1 2.1	1 2.1
• Use of library: i.e. research, reports, etc.	8 16.7	28 58.3	10 20.8	2 4.2	-
• Other:	-	-	2 4.2	4 8.3	-

Note: A dash indicates no response was reported. Percents are listed below frequencies.

TABLE C46
FREQUENCIES OF TIME SPENT BY TPS MIDDLE SCHOOL SCIENCE TEACHERS IN VARIOUS TASKS

16. How much of the time is spent by you the **TEACHER**, doing each of the following?	Never	Less than once a month	Once a month	Once a week	Almost daily
• Lecturing and discussing	-	-	3 6.3	16 33.3	29 60.4
• Use of guest speakers	4 8.3	32 66.7	12 25	-	-
• Field trips	13 27.1	34 70.8	1 2.1	-	-
• Use of audiovisual materials: I.e.: videos, laser disc, films, slides, etc.	- 0	5 10.4	14 29.2	21 43.8	8 16.7
• Discipline problems	3 6.3	8 16.7	3 6.3	9 18.8	25 52.1
• Other:	-	-	1 2.1	-	3 6.3

Note: A dash indicates no response was reported. Percents are listed below frequencies.

SECTION D: ENVIRONMENTAL EDUCATION

17. Is an outdoor site available for teaching science?
    a. Yes b. No c. Sometimes

TABLE C47
FREQUENCIES OF OUTDOOR SITE AVAILABILITY OF TPS MIDDLE SCHOOLS

	FREQUENCY	PERCENT
Sometimes	7	14.6
No	24	50.0
Yes	17	35.4

18. Does the school cooperate in providing an outdoor site for science use only?
    a. Yes b. No c. Sometimes

TABLE C48
FREQUENCIES OF SCIENCE CLASS USE OF OUTDOOR SITES OF TPS MIDDLE SCHOOLS

	FREQUENCY	PERCENT
Sometimes	7	14.6
No	29	60.4
Yes	9	18.8
Missing	3	6.3

19. Circle the environmental topics that are part of you curriculum?

TABLE C49
FREQUENCIES OF ENVIRONMENTAL TOPICS IN TPS MIDDLE SCHOOL SCIENCE CLASSES

ENVIRONMENTAL TOPICS	YES FREQUENCY	PERCENT
Earth Day	31	64.6
Ecology of Plants & Animals	26	54.2
Energy Conservation	26	54.2
Environmental Law	6	12.5
Natural Resources	23	47.9
Pollution of Air, Water, etc.	34	70.8
Recycling	35	72.9
Rock Cycle	26	54.2
Soil Formation	19	39.6
Water Cycle	31	64.6
Weather	21	43.8
Weathering & Erosion	29	60.4
Other:	6	12.5

20. How much class time is spent by **STUDENTS** doing each of the following: Using an outdoor site for environmental instruction?

TABLE C50
FREQUENCIES OF TIME SPENT ON OUTDOOR ACTIVITIES BY TPS MIDDLE SCHOOL SCIENCE STUDENTS

20. How much class time is spent by **STUDENTS** doing each of the following:	Never	Less than once a month	Once a month	Once a week	Almost daily
• Using an outdoor site for environmental instruction?	19 39.6	22 45.8	5 10.4	1 2.1	-
• Using Hands-on activities: i.e.: use of manipulatives, experimenting, using lab materials, etc., in an outdoor setting?	14 29.2	18 37.5	5 10.4	6 12.5	3 6.3
• Using a textbook in an outdoor setting: i.e. reading assignments	32 66.7	12 25.0	3 6.3	1 2.1	-
• Doing paper & pencil work in an outdoor setting: i.e.: answering questions, worksheets, defining vocabulary words, outlining chapters, etc.	33 68.8	12 25.0	3 6.3	-	-

Note: A dash indicates no response was reported. Percents are listed below frequencies.

TABLE C51
FREQUENCIES OF USE OF AN OUTDOOR SITE BY TPS MIDDLE SCHOOL SCIENCE TEACHERS

USE OF OUTDOOR SITE	FREQUENCY	PERCENT
Almost Daily	-	-
Once Per Week	1	2.1
Once Per Month	5	10.4
Less than Once Per Month	22	45.8
Never	19	39.6
Missing	1	2.1

TABLE C52
FREQUENCIES OF HANDS-ON ACTIVITIES IN AN OUTDOOR SITE BY TPS MIDDLE SCHOOL SCIENCE TEACHERS

HANDS-ON ACTIVITIES IN AN OUTDOOR SITE	FREQUENCY	PERCENT
Almost Daily	3	6.3
Once Per Week	6	12.5
Once Per Month	5	10.4
Less than Once Per Month	18	37.5
Never	14	29.2
Missing	2	4.2

TABLE C53
FREQUENCIES OF TEXTBOOK USE IN AN OUTDOOR SITE BY TPS MIDDLE SCHOOL SCIENCE TEACHERS

TEXTBOOK IN AN OUTDOOR SITE	FREQUENCY	PERCENT
Almost Daily	-	-
Once Per Week	1	2.1
Once Per Month	3	6.3
Less than Once Per Month	12	25.0
Never	32	66.7

TABLE C54
FREQUENCIES OF PAPER AND PENCIL WORK IN AN OUTDOOR SITE BY TPS MIDDLE SCHOOL SCIENCE TEACHERS

PAPER WORK IN AN OUTDOOR SITE	FREQUENCY	PERCENT
Almost Daily	-	-
Once Per Week	-	-
Once Per Month	3	6.3
Less than Once Per Month	12	25.0
Never	33	68.8

The following data shows the comparison of the number of years of teaching science to the total number of years of teaching experience.

TABLE C55
COMPARISON OF TEACHING EXPERIENCE TO YEARS OF TEACHING SCIENCE OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

	YEARS OF TEACHING SCIENCE				
TOTAL YEARS OF TEACHING	5 or Less	6-10	11-15	16-20	Over 20
5 or Less	18	-	-	-	-
6-10	1	9	-	-	-
11-15	-	1	4	-	-
16-20	-	-	1	3	-
Over 20	1	1	1	-	8

Note: Chi Square =131.509339 df =16 p < .00001
Cells with expected frequency < 5 = 24 of 25 (96.0%).
A dash indicates no data reported.

TABLE C56
COMPARISON OF TEACHING SCIENCE TO DISCIPLINE PROBLEMS OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

	DISCIPLINE PROBLEMS				
TOTAL YEARS OF TEACHING SCIENCE	NEVER	LESS THAN ONCE PER MONTH	ONCE PER MONTH	ONCE PER WEEK	ALMOST DAILY
5 or Less	1	3	2	4	10
6-10	1	2	1	1	6
11-15	-	2	-	2	2
16-20	-	-	-	2	1
Over 20	-	2	-	1	5

Note: Chi Square = 9.8680 df =16 p < .87334
Cells with expected frequency < 5 = 23 of 25 (92%).
A dash indicates no data reported.

TABLE C59
COMPARISON OF TEACHING SCIENCE TO TEACHERS DESIRE FOR SCIENCE EDUCATION OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

APPROPRIATE TRAINING

TOTAL YEARS OF TEACHING SCIENCE	NEVER	LESS THAN ONCE PER MONTH	ONCE PER MONTH	ALMOST DAILY
5 or Less	7	9	2	1
6-10	7	3	1	
11-15	1	4		
16-20	3			
Over 20	3	5		

Note: Chi Square =10.90888 df =12 p < .53674
Cells with expected frequency < 5 = 16 of 20 (80%).
A dash indicates no data reported.

TABLE C58
COMPARISON OF YEARS OF TEACHING TO DISCIPLINE PROBLEMS OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

DISCIPLINE PROBLEMS

TOTAL YEARS OF TEACHING	NEVER	LESS THAN ONCE PER MONTH	ONCE PER MONTH	ONCE PER WEEK	ALMOST DAILY
5 or Less	1	3	1	4	9
6-10	1	2	2	1	4
11-15		1		2	2
16-20				2	2
Over 20		3		1	7

Note: Chi Square =11.78464 df =16 p < .75867
Cells with expected frequency < 5 = 22 of 25 (88%).
A dash indicates no data reported.

TABLE C59
COMPARISON OF YEARS OF TEACHING TO TEXTBOOK USE OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

TEXTBOOK USE

TOTAL YEARS OF TEACHING	NEVER	LESS THAN ONCE PER MONTH	ONCE PER MONTH	ONCE PER WEEK	ALMOST DAILY
5 or Less	6	1	3	3	5
6-10	1		1		8
11-15	1	1			3
16-20	1				3
Over 20	3			2	6

Note: Chi Square = 16.11127 df =16 p = 0.44522
Cells with expected frequency < 5 =22 of 25 (88.0%)
A dash indicates no response reported.

TABLE C60
COMPARISON OF YEARS OF TEACHING TO USE OF HANDS-ON ACTIVITIES OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

HANDS-ON ACTIVITIES

TOTAL YEARS OF TEACHING	LESS THAN ONCE PER MONTH	ONCE PER MONTH	ONCE PER WEEK	ALMOST DAILY
5 or Less	2	3	10	3
6-10		2	7	1
11-15	1	1	1	2
16-20		2	1	1
Over 20		2	7	2

Note: Chi Square = 9.67751 df =12 p = 0.64423
Cells with expected frequency < 5 =17 of 20 (85.0%)
A dash indicates no response reported.

The following tables are from the 1977 National Survey of Science, Mathematics, and Social Studies Education which was conducted by the Research Triangle Institute (RTI) under contract to the National Science foundation (NSF). The tables show only part of the data collected.

Table C61

FREQUENCY OF USE OF VARIOUS TECHNIQUES
Grades 4-6 SCIENCE CLASSES
Percent of Classes

TECHNIQUES	NEVER	LESS THAN ONCE PER MONTH	ONCE PER MONTH	ONCE PER WEEK	ALMOST DAILY	MISSING
Lecture	12	6	9	43	23	8
Discussion	1	1	4	32	58	5
Students use hands-on manipulative or laboratory materials	13	19	25	25	11	8
Sample N = 271						

Note: (Weiss, 1978, p. B-61).

Table C62
FREQUENCY OF USE OF VARIOUS TECHNIQUES
Grades 7-9 SCIENCE CLASSES
Percent of Classes

TECHNIQUES	NEVER	LESS THAN ONCE PER MONTH	ONCE PER MONTH	ONCE PER WEEK	ALMOST DAILY	MISSING
Lecture	5	6	9	48	30	2
Discussion	1	2	4	34	56	3
Students use hands-on manipulative or laboratory materials	5	16	17	37	24	2
Sample N = 535						

Note: (Weiss, 1978, p. B-62).

TABLE C63
DATA OF TEACHING TECHNIQUES OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

TECHNIQUES	NEVER	LESS THAN ONCE PER MONTH	ONCE PER MONTH	ONCE PER WEEK	ALMOST DAILY	MISSING
Lecture & Discussion	-	-	6.25	33.33	60.41	-
Students use of hands-on manipulatives	5	16	17	37	24	2

Note: N = 48. A dash indicates no response reported. Data are shown in percentages.

TABLE C64
FREQUENCIES OF FACTORS THAT RESTRICT TEACHING FROM THE 1977 NSF SURVEY

FACTORS	SERIOUS PROBLEM	SOMEWHAT OF A PROBLEM	NOT A SIGNIFICANT PROBLEM
1. Inadequate facilities	26	40	34
2. Insufficient funds for equipment & supplies	24	39	36
3. Insufficient numbers of textbooks	7	16	77
4. Teacher inadequately prepared to teach subject matter	3	23	74
5. Lack of teacher planning time	7	31	61
6. Not enough time to teach subject	4	31	65
7. Class Size too large	19	44	37
8. Difficulty in maintaining discipline	6	30	64

Note: N = 535 . Data are in percentages from teachers of grades 7-9. (Weiss, 1978, p. B-128).

TABLE C65
FREQUENCIES OF FACTORS THAT RESTRICT TEACHING OF TPS MIDDLE SCHOOL SCIENCE TEACHERS

FACTORS	NEVER	LESS THAN ONCE PER MONTH	ONCE PER MONTH	ONCE PER WEEK	ALMOST DAILY
Insufficient funds for equipment & supplies	8.3	8.3	20.8	12.5	50
Insufficient numbers of textbooks	25	4.2	8.3	10.4	52.1
Teacher inadequately prepared to teach subject matter	43.8	43.8	6.3	-	2.1
Lack of teacher planning time	33.3	12.5	16.7	22.9	12.5
Not enough time to teach subject	18.8	20.8	18.8	27.1	12.5

Note: N = 48. Data are given in percentages. A dash indicates no response reported.

APPENDIX D

The following are teacher comments from TPS survey of middle school science teachers.

"I know this is of no consequence to your survey. Just had to get it off my chest. Thanks!"

"Kathryn-

I got a 2 week notice that I would teach 6,7,8 grade sciences this year. because I am the only 'Certified' teacher not teaching science already. I feel the students have been severely short changed due to my inexperience in this area. I had never taught science in my 27 years of teaching (never wanted to). but this year I found out how interesting it really is. I'm hoping I will have a schedule next year that will help me to have more activities with the kids. This year was not Conducive to labs due to Schedule and my inexperience. We did some but not nearly enough (especially 7th & 8th grade)".

"Responses reflect lack of desire to use the resources available-This is untrue-lack of discipline on part of students deters use".

Survey Question 7. How many years have you taught science?

"(1st year draftee)"

Survey Question 12. How many science workshops do you attend per year?

"1st year for science to plan"

Survey Question 14. How often do the following limit or restrain your teaching?

"Discipline Problems: Too Much!"

Textbooks:

"Textbooks are used as a resource."

"Use textbook 15 min./day"

"Textbook and P.A.S.S. and District objectives: "

"These are interactive. The texts don't fit the district objectives in 8th grade".

Covering Classes:

"cover classes 3X week"

"1 to 5 times wkly"

District Objectives "

Too many to adequate educate all students".

Budget Restraints:

"I purchase".

Other _____

"Heat in room"

"Time"

"Meetings!"

Survey Question 15. How much class time is spent by STUDENTS doing each of the following:

Hands-on

"More hands-on than once a week"

Use of computers

"Now have internet."

Textbooks

"1/2 year Not enough Books."

Other: _____

"Teachers getting materials ready."

"Meetings"

Survey Question 16. How much of the time is spent by you the TEACHER doing each of the following?

"Discipline problems Too Much!"

Other:

"Paper Work"

"This section is not very good in choices. It does not fit may style. I rotate short activities with paperwork My students are constantly being suspended, Dr.'s and In-schools susp. Although they may not be a direct problem in my room, their absences restrain their progress and their presence inhibits my choices of work and activities"

Survey Question 17. Is an outdoor site available for teaching science?

"We do go outside when the activity requires it. We have grounds 6th grade spends a week at Camp Walahili. There is a mowed field behind the school bordered by trees".

Survey Question 18. Does the school cooperate in providing an outdoor site for science use only?

"I don't believe a site has been requested for science only. I think we could".

"This is not a cooperation question".

Survey Question 19. Circle the environmental topics that are part of your curriculum?

Other:

"Entomology"

"Measuring, graphing, scientific method."

"We go to camp for outdoor Education 1 full week"

"More library than once a month"

"Science Club"

"All these topics are taught at some point in 6-7-8"

"Oil & gas exploration"

"Astronomy-Space Debris".

APPENDIX E

Oklahoma State University

Institutional Review Board

Human Subjects Review

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 02-06-96 **IRB#:** ED-96-070

Proposal Title: AN EVALUATION OF SCIENCE TEACHING METHODS OF OKLAHOMA MIDDLE SCHOOLS

Principal Investigator(s): Lowell Caneday, Kathryn Ainsworth

Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

ALL APPROVALS MAY BE SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT MEETING.
APPROVAL STATUS PERIOD VALID FOR ONE CALENDAR YEAR AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL.
ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

Comments, Modifications/Conditions for Approval or Reasons for Deferral or Disapproval are as follows:

Signature: _____ Date: February 9, 1996

Chair of Institutional Review Board

VITA

Kathryn Louise Ainsworth

Candidate for the Degree of

Master of Science

Thesis: AN EVALUATION OF MIDDLE SCHOOL SCIENCE TEACHING METHODS IN THE TULSA PUBLIC SCHOOL SYSTEM

Major Field: Environmental Science

Biographical:

Personal Data: Born in Tulsa, Oklahoma, On November 3, 1948, the daughter of William and Joanne Ainsworth.

Education: Graduated from Tulsa Central High School, Tulsa, Oklahoma in May 1967; received Bachelor of science degree in Elementary Education from Tulsa University, Tulsa, Oklahoma in May 1972. Completed the requirements for the Master of Science degree with a major in Education at Oklahoma State University in May 1997.

Experience: Raised in Tulsa, Oklahoma; employed as classroom teacher by Tulsa Public School System, 1972 to present.

Professional Memberships: National Education Association, Oklahoma Education Association, Tulsa Classroom Teachers Association.